Nipomo Mesa Management Area

4th Annual Report

Calendar Year 2011

Prepared by

NMMA Technical Group

Submitted April 2012

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Acronyms

AF	-	acre-feet
AF/yr	-	acre-feet per year
ALERT	-	Automated Local Evaluation in Real Time
C.E.G.	-	Certified Engineering Geologist
C.H.G.	-	Certified Hydrogeologist
CCAMP	-	Central Coast Ambient Monitoring Program
CDF	-	California Department of Forestry (now Cal Fire)
CIMIS	-	California Irrigation Management Information System
CPUC	-	California Public Utilities Commission
CU	-	consumptive use
D	-	day
DPH	-	California Department of Public Health
DWR	-	California Department of Water Resources
ES	-	Executive Summary
Ft	-	feet
ft^2	-	square feet
ft msl	-	feet above mean sea level
Gpd	-	gallons per day
GSWC	-	Golden State Water Company
K	-	hydraulic conductivity
MCL		Maximum Contaminant Level
mg/L	-	milligrams per Liter
Msl	-	mean sea level
NCSD	-	Nipomo Community Services District
NMMA	-	Nipomo Mesa Management Area
NSWP		Nipomo Supplemental Water Project
TG	-	Nipomo Mesa Management Area Technical Group
P.E.	-	Professional Engineer
P.G.	-	Professional Geologist
PG&E		Pacific Gas & Electric
RF	-	return flow
RP	-	reference point
RWC	-	Rural Water Company
SCWC		Southern California Water Company (now Golden State Water Company)
SLO	-	San Luis Obispo County
SLO DPW	-	San Luis Obispo County Department of Public Works
SWP	-	State Water Project
TDS	-	Total Dissolved Solids
U.S.	-	United States
WWTF	-	wastewater treatment facility
WY	-	Water Year
Yr	-	year

Abbreviations

Blacklake WWTF	-	Blacklake Reclamation Facility
Cypress Ridge WWTF	-	Rural Water Company's Cypress Ridge Wastewater Facility
Judgment	-	Judgment After Trial dated January 25, 2008
Phase III	-	Santa Maria Groundwater Litigation Phase III
Program	-	Nipomo Mesa Management Area Monitoring Program
Santa Maria Groundwater Litigation	-	*Santa Maria Valley Water Conservation District vs. City of Santa Maria, et al.* Case No. 770214
Southland WWTF	-	Southland Wastewater Treatment Facility
Stipulation	-	Stipulated Judgment dated June 30, 2005
Temp	-	Temperature
Woodlands	-	Woodlands Mutual Water Company
Woodlands WWTF	-	Woodlands Mutual Water Company Wastewater Reclamation Facility

Executive Summary

This 4th Annual Report, covering calendar year 2011 for the Nipomo Mesa Management Area (NMMA), is prepared in accordance with the Stipulation and Judgment for the Santa Maria Groundwater Litigation (Lead Case No. 1-97-CV-770214). The Annual Report provides an assessment of hydrologic conditions for the NMMA based on an analysis of the data accruing each calendar year. Each Annual Report is submitted to the court annually in accordance with the Stipulation in the year following that which is assessed in the report. This Executive Summary contains three sections: ES-1 Background; ES-2 Findings; and ES-3 Recommendations.

ES-1 Background

The NMMA Technical Group (TG) is one of three management areas committees established by the Court and charged with developing the technical bases for sustainable management of the surface and groundwater supplies available to each of the management areas. The TG is the committee for the NMMA. The NMMA lies between the Northern Cities Management Area to the north and the Santa Maria Valley Management Area to the south. The goal of each management area is to promote monitoring and management practices so that present and future water demands are satisfied without causing long-term damage to the underlying groundwater resource.

The TG, a committee formed to administer the relevant provisions of the Stipulation regarding the NMMA, prepared this 4th Annual Report Calendar Year 2011. ConocoPhillips, Golden State Water Company, Nipomo Community Services District, and Woodlands Mutual Water Company are responsible for appointing the members of the committee, and along with an agricultural overlying landowner, who is also a Stipulating Party, are responsible for the preparation of this Annual Report.

The TG collected and compiled data and reports from numerous sources including the NMMA Monitoring Parties, Counties of San Luis Obispo and Santa Barbara, California Department of Water Resources and Department of Public Health, the U. S. Geologic Survey and the Management Area Engineers for the Northern Cities and Santa Maria Valley Management Areas. The TG developed an electronic database to aid in the evaluation of the long-term sustainability of the NMMA portion of the Santa Maria Groundwater Basin. The TG reviewed these data and reports and concluded that the development of additional data and evaluations will be on-going to aid the understanding of the hydrogeologic conditions of the NMMA and to make comprehensive recommendations for the long-term management of the NMMA.

The TG evaluated the available compiled data to reach the findings presented in the following section of this Executive Summary. The TG recognizes that the data used in the evaluations are not equally reliable but represent what is currently available. In some cases, additional analysis will be required for an adequate characterization of the physical setting within NMMA to develop an appropriately detailed model of the stratigraphy, defining the location and thickness of production aquifers and confining layers. Refinements in the understanding of the physical setting will improve upon estimates of groundwater in storage available for pumping to meet water demands. Such work is an important goal for the TG and mirrors the TG's desire to characterize groundwater storage in the NMMA. The TG has developed specific recommendations to address these issues for the next Annual Report.

ES-2 Findings

Presented in this section of the Executive Summary are brief descriptions of the findings by the TG for calendar year 2011. Presented in the body of this report are the details and bases for these findings.

1. The TG recommends that the Nipomo Supplemental Water Project be implemented as soon as possible (see Section 9.3 Technical Recommendations, see Appendix F NSWP Technical Memorandum).

2. Potentially Severe Water Shortage Conditions continue to exist in the NMMA as indicated by the Key Wells Index (see Section 7.2 Water Shortage Conditions). Coastal water quality and water levels continue to be better than thresholds for Water Shortage Conditions (i.e., chloride concentrations are less than threshold concentrations and groundwater elevations are higher than threshold elevations). Potentially Severe Water Shortage Conditions trigger a voluntary response plan as presented in the Water Shortage Conditions and Response Plan (see Section 7.2.1 Status of Water Shortage Conditions).

3. Spring groundwater elevations underlying the NMMA, indicated by the Key Wells Index of eight (8) wells, decreased sharply from 2010 levels after a slight increase last year following a three consecutive year decline (see Section 7.1.1 Groundwater Conditions). Several of the Key Wells have seen declining groundwater elevations since about 2000 (see Section 6.1.1 Results from Inland Key Wells).

4. There are a number of direct measurements that indicate that demand exceeds the ability of the supply to replace the water pumped from the aquifers (see Section 7.1.2 Hydrologic Inventory).

5. The final environmental documentation for the Nipomo Supplemental Water Project is completed and NCSD has informed the TG that construction could begin in late 2012 (see Section 1.1.7 Supplemental Water).

6. Total rainfall for Water Year 2011 (October 1, 2010 through September 30, 2011) is approximately 180 percent of the long-term average (see Section 3.1.3 Rainfall).

7. The period of analysis (1975-2011) used by the TG is roughly 11 percent "wetter" on average than the long-term record (1920-2011) indicating there is a slight bias toward overstating the amount of local water supply resulting from percolation of rainfall (see Section 7.3.1 Climatological Trends).

8. The total estimated 2011 calendar year groundwater production is 10,538 acre-feet (AF). The breakdown by user and type of use is shown in the following table (see Section 3.1.9 Groundwater Production (Reported and Estimated)).

Agriculture	2,465 AF
Urban/Industrial	8,073 AF
Total Production	**10,538 AF**

9. The total Waste Water Treatment Facility effluent discharged in the NMMA was 780 AF for Calendar Year 2011 (see Section 3.1.10 Wastewater Discharge and Reuse).

10. Contour maps prepared using Spring and Fall 2011 groundwater elevations suggests subsurface flow is generally from east to west (toward the ocean). They also show a nearly flat gradient in a localized area near the coast (see Section 6.1.3 Groundwater Contours and Pumping Depressions).

11. The acreage for land use classification of Urban is 10,246 acres; of Agriculture is 2,587 acres; and, of Native is 8,314 acres (see Section 3.1.8 Land Use).

12. There is no evidence of any water quality issues including seawater intrusion that significantly restrict current use of groundwater to meet the current water demands, except for one nitrate exceedance in the northern portion of the NMMA. Nitrate concentration measurements in portions of the NMMA are more than half the drinking water MCL in 2011, and much of the NMMA has relatively high TDS concentrations, up to 1,100 mg/l (see Section 6.2.2 Results of Inland Water Quality Monitoring).

13. There is a lack of understanding of the contribution of Los Berros and Nipomo Creeks to the NMMA water supplies (see Section 3.1.5 Streamflow).

14. There is a lack of understanding about confined and unconfined aquifer conditions in the NMMA, except near the coast and locally adjacent areas where the Deep Aquifers are known to be confined (see Section 2.3.2 Groundwater Flow Regime).

15. There is a lack of understanding of the flow path of rainfall, applied water, and treated wastewater to specific aquifers underlying the NMMA (see Section 3.1.10 Wastewater Discharge and Reuse).

ES-3 Recommendations

A list of recommendations were developed and published in each of the previous NMMA Annual Reports. The TG will address past and newly developed recommendations along with the implementation schedule based on future budgets, feasibility, and priority. The recommendations are subdivided into three categories: (1) Draft capital and operation expenditure plan, (2) Achievements from earlier NMMA Annual Report recommendations accomplished in 2011; and (3) Technical Recommendations – to address the needs of the TG for data collection and compilation.

ES-3.1 Funding Recommendations

The TG acknowledges that the work items and budget presented below represent a consensus view that additional technical work is necessary beyond that covered under the current annual budget limit. Completing this broader scope of work will require a formal adjustment to the NMMA TG budget limit.

NMMA 5-Year Cost Analysis

Task Description	Total Cost	Targeted Completion Year	Projected 5-year Cash Flow				
			2012	2013	2014	2015	2016
Yearly Tasks							
Annual Report preparation			$50,000	$50,000	$50,000	$50,000	$50,000
Grant funding efforts			$10,000	$10,000	$10,000	$10,000	$10,000
Confining layer definition			$10,000	$10,000	$10,000	$10,000	$10,000
Well head surveying			$3,000	$3,000	$3,000	$3,000	$3,000
Analytical testing			$5,000	$5,000	$5,000	$5,000	$5,000
Long Term Studies							
Groundwater model (NMMA share)	$250,000	2016	$33,300	$33,300	$33,300	$75,000	$75,000
Capital Projects							
Oso Flaco monitoring well	$130,000	2014	$43,300	$43,300	$43,300	- -	- -
Automatic monitoring equipment	$25,000	2016	- -	- -	- -	$12,500	$12,500
Total Projected Annual Cost			$154,600	$154,600	$154,600	$165,500	$165,500

ES-3.2 Achievements from Previous NMMA Annual Report Recommendations

The TG worked diligently to address several of the recommendations outlined in the previous Annual Reports. Accomplishments and/or progress made during 2011 include:

- Development of refined cross sections through key areas of the basin.
- Reviewed and identified existing well locations and recommended additional monitoring to be incorporated into the County water level monitoring program.
- Met with representatives from Northern Cities Management Area and Santa Maria Valley Management Area to discuss groundwater modeling possibilities, groundwater monitoring activities, methodology to estimate percolation, and sea water intrusion findings.

ES-3.3 Technical Recommendations

The following technical recommendations are not organized in their order of priority because the monitoring parties, considering their own particular funding constraints and authorities, will determine the implementation strategies and priorities. However, the TG has suggested a priority for some of the technical recommendations.

- **Supplemental Water Supply –** An additional water supply that would allow reduced pumping within the NMMA is the most effective method of reducing the stress on the aquifers and allow groundwater elevations to recover. The NSWP (see Section 1.1.7-Supplemental Water) is the fastest method of obtaining alternative water supplies. Given the Potentially Severe Water Shortage Conditions within the NMMA and the other risk factors discussed in this Report, the TG recommends that this project be implemented as soon as possible.

- **Subsurface Flow Estimates – C**ontinue to develop and evaluate geologic cross-sections along NMMA boundaries and make estimates of subsurface flow.

- **Severe Water Shortage Conditions –** The TG will evaluate the potential mandatory responses to the Severe Water Shortage Conditions as prescribed in the Stipulation Paragraph VI(D)(1b)(i)-(v).

- **Installation of Groundwater Monitoring Equipment –** When a groundwater level is measured in a well, both the length of time since the measured well is shut off and the effect of nearby pumping wells modify the static water level in the well being measured. For the Key Wells, the installation of transducers and data loggers will largely solve this problem. Installation of transducers is also recommended for purveyors' wells that pump much of the time.

- **Changes to Monitoring Points or Methods –** The coastal monitoring wells are of great importance in the Monitoring Program. The inability to locate the monitoring well cluster under the sand dunes proximally north of Oso Flaco Lake renders the southwestern coastal portion of the NMMA without adequate coastal monitoring. During 2009 and 2010, the NMMA TG reviewed options for replacing this lost groundwater monitoring site. The TG was given written support of the concept from the State Parks Department to allow replacement of the well, and the TG has also had discussions with San Luis Obispo County, which may be able to provide some financial assistance for the project. The NMMA TG has incorporated replacement of this monitoring well in its long-term capital project planning and will investigate possible State or Federal grants for financial assistance with the construction of this multi-completion monitoring well.

- **Well Management Plan –** It is recommended that for calendar year 2012, purveyors compile and present to the TG a Well Management Plan status update.

- **County of San Luis Obispo Monitoring Locations –** Review proposed County of San Luis Obispo monitoring well and stream gauge locations.

- **Well Reference Point Elevations –** It is recommended that all the wells used for monitoring have an accurate RP elevation established over time. This could be accomplished by surveying a few wells every year or by working with the other Management Areas and the two counties in the Santa Maria Groundwater Basin to obtain LIDAR data for the region; the accuracy of the LIDAR method allows one-foot contours to be constructed and/or spot elevations to be determined to similar accuracy.

- **Groundwater Production –** Estimates of total groundwater production are based on a combination of measurements provided freely from some of the parties, and estimates based on land use. The TG recommends developing a method to collect groundwater production data from all stipulating parties. The TG recommends updating the land use classification on an interval commensurate with growth and as is practical with the intention that the interval is more frequent than DWR's 10-year cycle of land use classification.

- **Increased Collaboration with Agricultural Producers –** To better estimate agricultural groundwater production where data is incomplete, it is recommended that the TG work with a subset of farmers to measure groundwater production. This measured groundwater production can then be used to calibrate models and verify estimates of agricultural groundwater production where data are not available.

- **Hydrogeologic Characteristics of NMMA –** Further defining the continuity of confining conditions within the NMMA remains a topic of investigation by the TG. The locations of confined and unconfined conditions is important – they control to a significant degree both the NMMA groundwater budget as to the quantity of recharge from overlying sources and any calculation of changes in groundwater storage. Further review of well screen intervals, lithology, groundwater level, and other relevant information to segregate wells into the different aquifers groups (e.g. shallow versus deep aquifers) for preparation of groundwater elevation contour maps for different aquifers. In addition, the NMMA will be requesting geologic information obtained during the PG&E long-term seismic studies program.

- **Modifications of Water Shortage Conditions Criteria –** The Water Shortage Conditions and Response Plan was submitted to the Court in 2008. The TG will review the plan on a regular basis.

- **Groundwater Modeling –** The TG continues to recommend the advancement of a groundwater model as presented in the NMMA 5-year Cost Analysis. This may include collaboration with the Northern Cities Management Area, the Santa Maria Valley Management Area or both.

1. Introduction

The rights to extract water from the Santa Maria Groundwater Basin have been in litigation since the late 1990s. By stipulation and Court action three separate management areas were established, the Northern Cities Management Area, the Nipomo Mesa Management Area (NMMA) and the Santa Maria Valley Management Area. Each management area was directed to form a group of technical experts to continue to study and evaluate the characteristics and conditions of each management area and present their findings to the Court in the form of an Annual Report.

This 4th Annual Report Calendar Year 2011 is a joint effort of the NMMA Technical Group (TG). The requirement contained in the Judgment for the production of an Annual Report is as follows:

> Within one hundred and twenty days after each Year, the Management Area Engineers will file an Annual Report with the Court. The Annual Report will summarize the results of the Monitoring Program, changes in groundwater supplies, and any threats to Groundwater supplies. The Annual Report shall also include a tabulation of Management Area water use, including Imported Water availability and use, Return Flow entitlement and use, other Developed Water availability and use, and Groundwater use. Any Stipulating Party may object to the Monitoring Program, the reported results, or the Annual Report by motion.

This Annual Report is organized into ten sections that presents: the general background of the litigation and some of the requirements imposed by the Court, a description of the Basin, Data Collection, Water Supply and Demand, Hydrologic Inventory, Groundwater Conditions, Analysis of Groundwater Conditions, Other Considerations, Recommendations; and References.

Six appendices are also included: Appendix A – NMMA Monitoring Program, Appendix B – NMMA Water Shortage Conditions and Response Plan, Appendix C – Well Management Plan, Appendix D – Data Acquisition Protocols for Groundwater Level Measurements for the NMMA, Appendix E – Additional Data, and Appendix F – Nipomo Supplemental Water Project (NSWP) Technical Memorandum.

1.1. *Background*

Presented in this subsection is the history of the litigation process and general discussions of activities that have been undertaken to date or are underway to manage the water resources of the NMMA.

1.1.1. History of the Litigation Process

The Santa Maria Groundwater Basin has been the subject of ongoing litigation since July 1997. Collectively called the Santa Maria Groundwater Litigation (*Santa Maria Valley Water Conservation District vs. City of Santa Maria, et al.* Case No. 770214), over 1,000 parties were involved with competing claims to pump groundwater from within the boundary of the Santa Maria Groundwater Basin (Figure 1-1).

The Santa Maria Valley Water Conservation District was originally concerned that banking of State Water Project (SWP) water in the groundwater basin by the City of Santa Maria would give the City priority rights to the groundwater. The lawsuit was broadened to address groundwater management of the entire Santa Maria Groundwater Basin.

On June 30, 2005, the Stipulating Parties entered a Stipulated Judgment ("Stipulation") in the case that was approved by the Court on August 3, 2005. The Stipulation divides the Santa Maria Groundwater Basin into three separate management sub-areas (the Northern Cities Management Area, the Nipomo Mesa Management Area (NMMA), and the Santa Maria Valley Management Area). The Stipulation contains specific provisions with regard to rights to use groundwater, development of groundwater monitoring programs, and development of plans and programs to respond to Potentially Severe and Severe Water Shortage Conditions.

The TG was formed pursuant to a requirement contained in the Stipulation. Sections IV D (All Management Areas) and Section VI (C) (Nipomo Mesa Management Area) contained in the Stipulation were independently adopted by the Court in the Judgment After Trial (herein "Judgment"). The Judgment is dated January 25, 2008, and was entered and served on all parties on February 7, 2008.

It is noted that pursuant to paragraph 5 of the Judgment, the TG retains the right to seek a Court Order requiring non-stipulating parties to monitor their well production, maintain records thereof, and make the data available to the Court or the Court's designee. The compilation and evaluation of existing data, and the aggregation of additional data, are ongoing processes. Given its limited budget and resources, the TG has focused its efforts on the evaluation of readily accessible data. The TG does intend to slowly integrate into its assessment new data that may be collected from stipulating parties and other sources that were not previously compiled as part of the existing database.

1.1.2. Description of the Nipomo Mesa Management Area Technical Group

The TG is composed of representatives of the Nipomo Community Services District (NCSD), Golden State Water Company (GSWC) (formerly named Southern California Water Company), ConocoPhillips, Woodlands Mutual Water Company (Woodlands), and an agricultural user that is also a Stipulating Party. Rural Water Company (RWC) is responsible for funding a portion of the TG's efforts, but does not appoint a representative to the TG. The TG is responsible for conducting and funding the Monitoring Program. In-lieu contributions through engineering services may be provided, subject to agreement by those parties. The budget of the TG shall not exceed $75,000 per year without prior approval of the Court. The TG is responsible for preparing the Monitoring Program, conducting the Monitoring Program, and preparing the Annual Reports. The TG attempts to develop consensus on all material issues. If the TG is unable to reach a consensus, the matter may be taken to the court for resolution.

The TG may hire individuals or consulting firms to assist in the preparation of the Monitoring Program and Annual Reports (the Judgment describes these individuals or consulting firms as the "Management Area Engineer"). The representatives to the TG, as a group, function as the Management Area Engineer (Table 1-1). The TG Monitoring Parties have the sole discretion to select, retain, and replace the Management Area Engineer.

Table 1-1. NMMA Technical Group

Monitoring Parties	Management Area Engineers
Agricultural Users	Jacqueline Frederick, J.D.
ConocoPhillips	Steve Bachman, Ph.D., P.G.
ConocoPhillips	Norm Brown, Ph.D., P.G.
Golden State Water Company	Robert Collar, P.G., C.H.G.
Golden State Water Company	Toby Moore, Ph.D., P.G., C.H.G.
Golden State Water Company	Ken Petersen, P.E.
Nipomo Community Services District	Brad Newton, Ph.D., P.G.
Woodlands	Tim Cleath, P.G., C.H.G., C.E.G.
Woodlands	Rob Miller, P.E.

1.1.3. Coordination with Northern Cities and Santa Maria Valley Management Areas

The NMMA is bounded on the north by the Northern Cities Management Area and on the south by the Santa Maria Valley Management Area (Figure 1-1). Subsurface Flows is monitored in all three Management Areas by comparing groundwater elevation data on each side of the management area boundary to determine the gradient and direction of flow. Groundwater elevation data is collected within the boundaries and shared with the others to allow estimates of the quantity and direction of flow. The TG has incorporated this concept in its monitoring program submitted to the court and described in the next section. It is understood that the neighboring subareas will do the same.

One of the sources of uncertainty is the subsurface quantity of groundwater that crosses the NMMA boundaries. The TG recognizes that collaborative technical efforts with the Northern Cities Management Area and Santa Maria Valley Management Area technical groups will be important to the appropriate management of the basin. Examples of current collaborative efforts include:

- Sharing of technical data throughout the year, and during the preparation of Annual Reports,
- Opportunities for review and comment on technical work products,
- Sharing of protocols and standards for data collection and analysis, and
- Consideration of jointly-pursued projects and grant opportunities.

As the conditions of the existing basin underlying the NMMA are described in subsequent sections, periodic reference will be made to the Annual Reports produced by the two neighboring technical groups. The aerial extent of groundwater contours has also been limited to the immediate vicinity of the NMMA.

1.1.4. Development of Monitoring Program

In 2008, the TG developed and the Court approved the NMMA Monitoring Program (“Monitoring Program”), attached as Appendix A, to ensure systematic monitoring of important information in the basin. This Monitoring Program includes information such as groundwater elevations, groundwater quality, and pumping amounts. The Monitoring Program also identifies a number of wells in the NMMA to be monitored (Figure 1-3) and discusses the methods of analysis of the data.

A large areal extent within the NMMA receives water service from the major water purveyors (Figure 1-2). The majority of the lands within the NMMA obtain water by means other than from a purveyor. A fraction of these property owners are Stipulating Parties. All of the larger purveyors are also Stipulating Parties. All Stipulating Parties are obligated to make available relevant information regarding groundwater elevations and water quality data necessary to implement the NMMA Monitoring Program.

1.1.5. Development of Water Shortage Conditions and Response Plan

Pursuant to the Stipulation, the TG developed a Water Shortage Conditions and Response Plan that is included as part of the Monitoring Program. The Water Shortage Conditions are characterized by two different criteria – those for Potentially Severe Water Shortage Conditions and those for Severe Water Shortage Conditions. The Response Plan for these conditions includes voluntary and mandatory actions by the parties to the Stipulation. The Court approved the Water Shortage Conditions and Response Plan on April 22, 2009, and the document is attached as Appendix B to this report.

1.1.6. Well Management Plan

The Stipulation requires the preparation of a Well Management Plan when Potentially Severe Water Shortage Conditions or Severe Water Shortage Conditions exist prior to the completion of a Supplemental Water project. The Well Management Plan provides for steps to be taken by the NCSD, GSWC, Woodlands and RWC under these water shortage conditions. The Well Management Plan has no applicability to either ConocoPhillips or Overlying Owners as defined in the Stipulation. The Well Management Plan was adopted by the TG in January 2010 and is attached as Appendix C to this report.

There are currently no facilities to transfer water between RWC and the other purveyors. Beginning in 2010, NCSD and RWC began discussing the planning and design related to establishing facilities to convey water.

1.1.7. Supplemental Water

The provisions in the Stipulation regarding Supplemental Water provide in relevant part:

> "The NCSD agrees to purchase and transmit to the NMMA a minimum of 2,500 acre-feet of Nipomo Supplemental Water each Year. However, the NMMA Technical Group may require NCSD in any given Year to purchase and transmit to the NMMA an amount in excess of 2,500 acre-feet and up to the maximum amount of Nipomo Supplemental Water which the NCSD is entitled to receive under the MOU if the Technical Group concludes that such an amount is necessary to protect or sustain Groundwater supplies in the NMMA. The NMMA Technical Group also may periodically reduce the required amount of Nipomo Supplemental Water used in the NMMA so long as it finds that groundwater supplies in the NMMA are not endangered in any way or to any degree whatsoever by such a reduction."

> "Once the Nipomo Supplemental Water is capable of being delivered, those certain Stipulating Parties listed below shall purchase the following portions of the Nipomo Supplemental Water Yearly:
>
> NCSD - 66.68%
> Woodlands - 16.66%
> SCWC (i.e. GSWC) - 8.33%
> RWC - 8.33%

The final Judgment entered on January 24, 2008, states: "The court approves the Stipulation, orders the Stipulating Parties only to comply with each and every term thereof, and incorporates the same herein as though set forth in full." Thus, the terms of the Stipulation as herein stated must be complied with in accordance with the order of the Court.

The NCSD is developing a project (i.e. the NSWP) to bring Supplemental Water to the above referenced Stipulating Parties within the NMMA. The NSWP involves the construction of approximately five miles of new water main to transport up to 3,000 AF of water from the City of Santa Maria. The project is nearing 100% design completion. In the first year of operation, NCSD expects to purchase 2,000 AF of water from the City. The final EIR has been certified by NCSD as lead agency and the City of Santa Maria as a responsible agency. The final Supplemental Water Agreement has been approved by NCSD and the City of Santa Maria. The current construction cost estimate for the project is $25,800,000. The County of San Luis Obispo granted NCSD permission to form an assessment district to finance the capital costs of the project. Property owners in the four water service areas are scheduled to vote on formation of the Assessment District in Spring 2012. If the assessment district is approved, construction of the project will commence in September 2012 with a scheduled completion date of February 2014. DWR has awarded the NSWP a grant of $2,300,000 in support of the project. All four purveyors will be required to adopt a rate structure to support purchasing their share of the supplemental water. For GSWC and RWC, this will require California Public Utilities Commission approval. For NCSD, this will require Proposition 218 protest proceedings. The TG prepared an evaluation of the basin impacts from NSWP deliveries (see Appendix F).

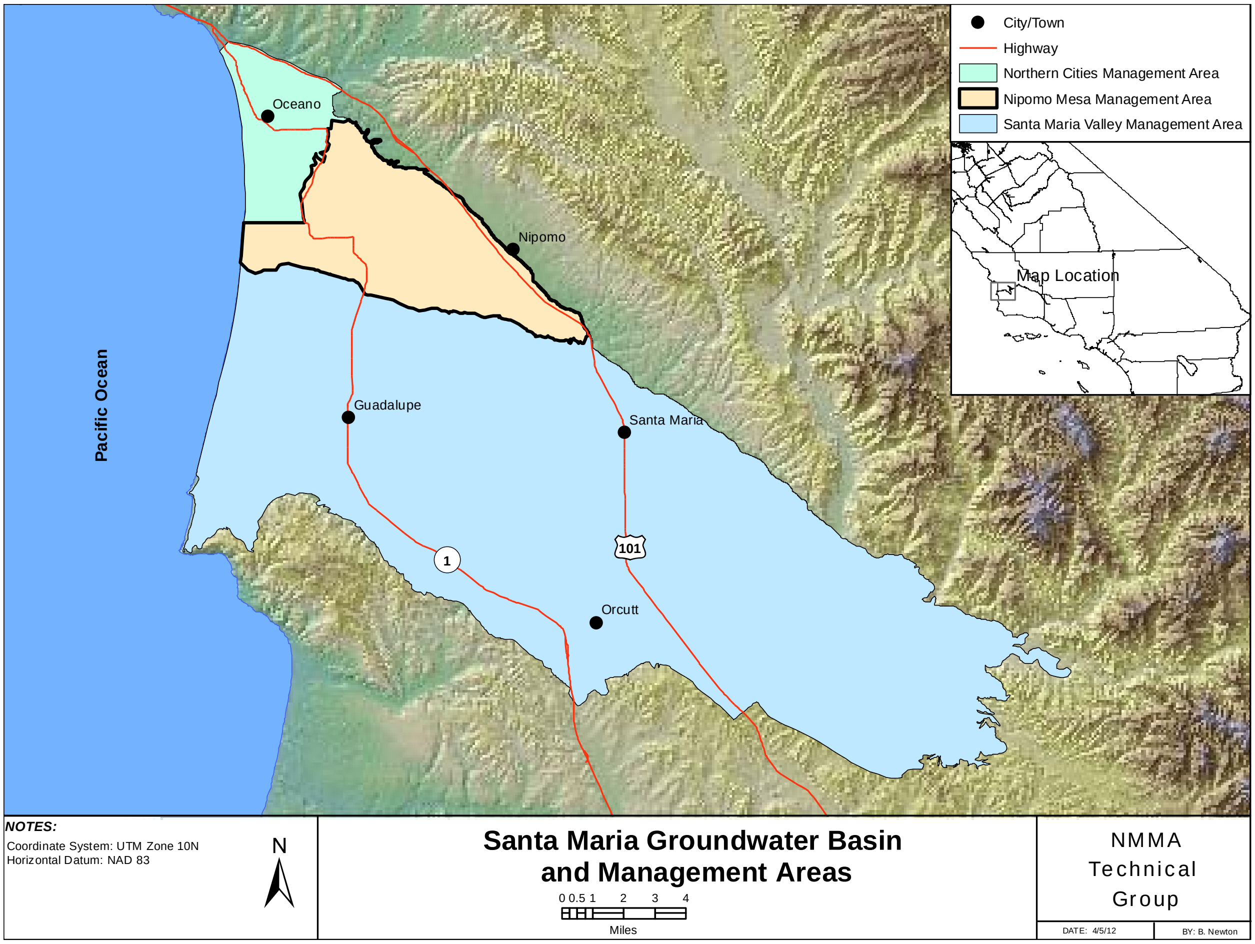

Figure 1-1. Santa Maria Groundwater Basin and Management Areas

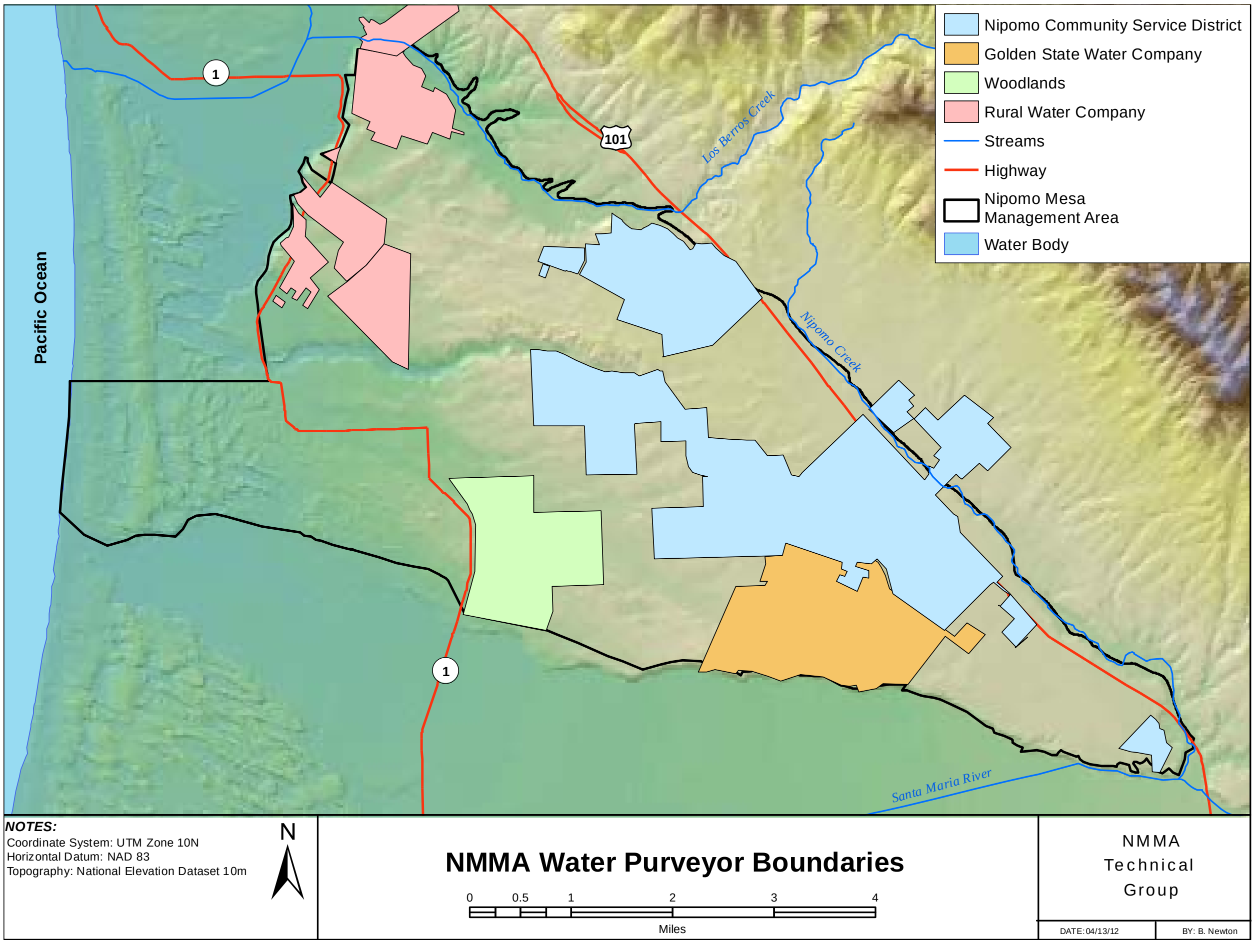

Figure 1-2. NMMA Water Purveyor Boundaries

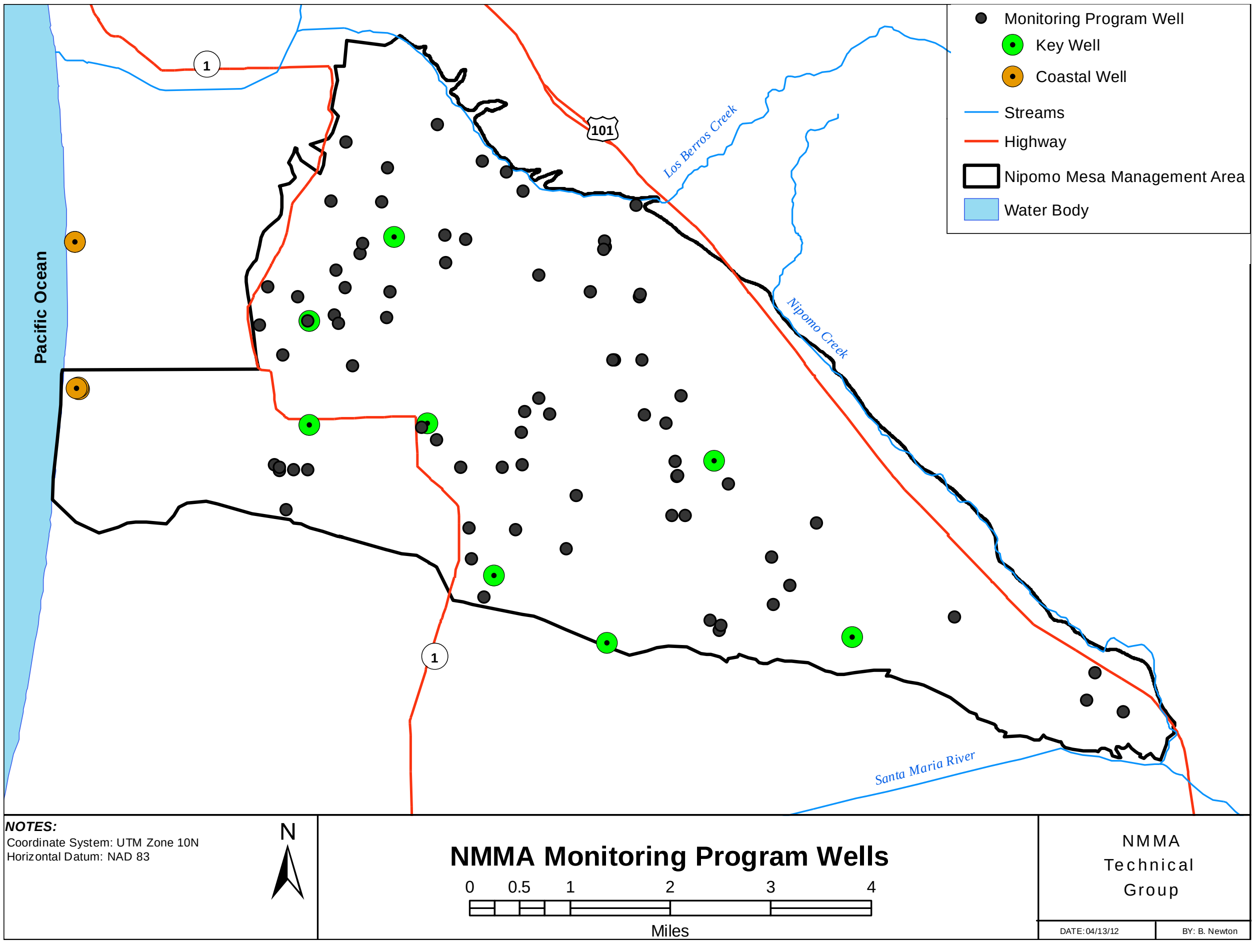

Figure 1-3. NMMA Monitoring Program Wells

2. Basin Description

The Santa Maria Groundwater Basin, covering a surface area of approximately 256 square miles, is bounded on the north by the San Luis and Santa Lucia mountain ranges, on the south by the Casmalia-Solomon Hills, on the east by the San Rafael Mountains, and on the west by the Pacific Ocean. The basin receives water from rainfall directly and runoff from several major watersheds drained by the Cuyama River, Sisquoc River, Arroyo Grande Creek, and Pismo Creek, as well as many minor tributary watersheds. Sediment eroded from these nearby mountains and deposited in the Santa Maria Valley formed beds of unconsolidated alluvium, averaging 1,000 feet in depth, with maximum depths up to 2,800 feet and comprise the principal production aquifers from which water is produced to supply the regional demand. Three management areas were defined to recognize that the development and use of groundwater, State Water Project water, surface water storage, and treatment and distribution facilities have historically been financed and managed separately, yet they are all underlain by or contribute to the supplies within the same groundwater basin.

2.1. *Physical Setting*

The NMMA has physical characteristics which are distinct from the other two management areas. It is largely a mesa area that is north of the Santa Maria River, west of the San Luis Range and south of the Arroyo Grande Creek, with a lower lying coastal environment to the west. The mesa was formed when the Santa Maria River and Arroyo Grande Creek eroded the surrounding area. The current coastal environment developed subsequently, is composed of beach dunes and lakes, and is currently a recreational area with sensitive species habitat. Locally, hummocky topography on the mesa area reflects the older dune deposits. Black Lake Canyon is an erosional feature north-central in the NMMA and where the dune deposit thickness is exposed.

2.1.1. Area

The NMMA covers approximately 33 square miles or 21,100 acres, which accounts for approximately 13 percent of the overall Santa Maria Groundwater Basin (164,000 acres). Approximately 13,000 acres on the NMMA, or 60 percent, is developed land requiring water pumped from the underground aquifers to sustain the agricultural and urban development.

2.1.2. General Land Use

Land uses include agricultural, urban (residential/commercial), and native or undeveloped areas. There are also three golf courses and one oil-processing facility. The crop types grown in the order of largest acreage were strawberries, nursery, avocado, and rotational vegetables (broccoli, lettuce, etc.) based on a survey in year 2009.

2.2. *Climate*

A Mediterranean-like climate persists throughout the area with cool moist winters and warm dry summers. During the summer months, the warm air inland rises and draws in the relatively cooler marine layer near the coastline keeping summer cooler and providing moisture for plant growth, while in the winter months the relatively warmer ocean temperature keeps the winter warmer. The average annual maximum temperature is 69 degrees Fahrenheit, and the average annual minimum temperature is 46 degrees Fahrenheit. Precipitation normally occurs as rainfall between November and April when cyclonic storms originating in the Pacific Ocean move onto the continent. The long-term (1959 to 2011) average annual rainfall reported at CDF Nipomo Rain Gauge #151.1 is 15.9 inches and is representative of the larger area of the NMMA. Rainfall variability exists across the NMMA and rainfall increases in the foothills and mountains due to the orographic (elevation) effect. The average annual evapotranspiration from standard turf (a well-watered actively growing closely clipped grass that is completely shading the soil) is 52 inches, and is referred to as the reference evapotranspiration (Table 2-1).

Table 2-1. Climate in the Nipomo Mesa Area

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Max Temp (Fahrenheit)[1]	63.3	64.3	64.8	66.9	68.3	70.6	72.8	73.2	74.4	73.5	69.2	64.3	68.8
Average Min Temp (Fahrenheit)[1]	39	40.9	42	43.4	46.8	50.1	53.1	53.6	52.2	48.1	42.6	38.7	45.9
Average Rainfall (inches)[2]	3.26	3.38	2.73	1.11	0.24	0.05	0.02	0.04	0.20	0.73	1.57	2.53	15.87
Monthly Average Reference Evapotranspiration (inches)[3]	2.21	2.50	3.80	5.08	5.70	6.19	6.43	6.09	4.87	4.09	2.89	2.28	52.13
Monthly Average Reference Evapotranspiration (inches)[4]	2.13	2.31	3.63	4.63	5.03	4.26	4.98	4.54	3.75	3.41	2.43	1.89	42.99

Notes:
1. Data from Santa Maria Airport - Nearest long-term temperature record to the NMMA in the Western Regional Climate Center is from the Santa Maria Airport, station #47946. The average is from 1948 through 2011. Source: http://www.wrcc.dri.edu/climsum.html2.
2. Data from CDF Nipomo Rain Gauge 151.1 (1959 to 2011).
3. Data from California Irrigation Management Information System (CIMIS) - Records at Nipomo (202) are less than 5 years; therefore, CIMIS reports the regional average for Central Coast Valleys for Station #202. Source: http://www.cimis.water.ca.gov/cimis/data.jsp
4. Data from California Irrigation Management Information System (CIMIS), calculated from monthly evapotranspiration (ET_o) for the period of record at Station 202 Nipomo (June 2006 to December 2011). Source: http://www.cimis.water.ca.gov/cimis/data.jsp

2.3. *Hydrogeology*

Groundwater management is founded upon an understanding of the geology and the groundwater flow regime specific to the NMMA.

2.3.1. Geology

The NMMA overlies part of the northwest portion of and is contiguous with the Santa Maria Groundwater Basin (Figure 1-1). The unconsolidated sedimentary deposits comprising the main aquifers of the groundwater basin underlying the NMMA include the Pliocene age Careaga Formation and the Plio-Pleistocene age Paso Robles Formation. These basin sedimentary formations are overlain by Quaternary age dune sands on the Mesa (Figure 2-1), and by the Quaternary age alluvium in Los Berros Valley and in Nipomo Valley (on the eastern perimeter of the NMMA) which, where saturated, are also aquifers. These sedimentary beds have been deposited within the Santa Maria Valley synclinal basin. The pre-Quaternary age sedimentary beds have been displaced by faults within and on the perimeter of the basin. The extent of the geologic formations and the faulting within the NMMA area are shown on the following geologic map. Further information on these geologic formations and the geologic structure is available in the 2nd Annual Report Calendar Year 2009.

The deep aquifers within the Paso Robles and Careaga Formations underlying the Nipomo Mesa comprise the main source of water for municipal and agricultural wells. The shallow aquifers in the Los Berros Valley alluvium and Nipomo Mesa dune sands are tapped by lower capacity domestic and agricultural wells. These deep and shallow aquifers are in places separated vertically by relatively low hydraulic conductivity layers (i.e. aquitards), which act locally as confining layers within the NMMA.

A cross section generally following the northwestern boundary of the NMMA from Los Berros Creek and Nipomo Hill in the north to Black Lake Canyon and State Route 1 (Figure 2-1) has been prepared based on well logs and geologic maps as a foundation for evaluating groundwater flow in this area. The cross section (Figure 2-2) was developed primarily using 19 wells distributed from north to south along, and located within roughly one half mile east (primarily) and west of, the approximately 4-mile-long cross section. The wells and associated lithology are not included on the cross section because they are considered confidential according to the California Water Code. It should be noted that this cross section represents a little more than about 10 percent of the roughly 30-mile-long boundary of the NMMA, but represents some unknown percentage of the saturated (i.e. below the water table) cross sectional area along the same boundary.

The cross section generally shows the land surface, relatively permeable aquifers tapped by many wells in the area, underlying relatively impermeable bedrock, and the Oceano fault. Aquifers include the Younger Alluvium, Dune Sand deposits, Paso Robles Formation (clay and gravel beds), and underlying marine sands of the Careaga Formation. The base of the Dune Sand slopes to the southwest from where it laps onto the Nipomo Hill bedrock at an elevation of more than 100 feet above sea level to an elevation of about 100 feet below sea level at the southern end of the cross section. The Paso Robles/Careaga Formation beds also slope to the southwest from Nipomo Hill toward Black Lake Canyon, where the base of these formations drops to an elevation of at least about 400 feet below sea level (Figure 2-2).

The relatively impermeable bedrock, which is tapped by very few wells, is comprised of the Cretaceous and Jurassic age Franciscan Complex rock and older sedimentary beds (early Pliocene age Sisquoc Formation). Franciscan Complex bedrock is exposed at the base of Nipomo Hill at Los Berros Road and remains very shallow to where State Route 1 goes up onto the Nipomo Mesa. As the sedimentary beds thicken toward the coast, older low permeability sedimentary beds underlie the water-bearing formations. These older sedimentary beds, though not as impermeable as the Franciscan Complex rock, are less permeable and contain poorer quality groundwater than the overlying Paso Robles and Careaga Formations.

The Oceano fault (U.S. Geological Survey and California Geological Survey, 2006) trends northwest-southeast as it crosses the NMMA boundary near Woodland Hills Road and Kip Lane. Displacement of the Paso Robles and Careaga Formations is evident, whereas displacement of the Dune Sands is not known. Movement on the fault has down-dropped aquifers to the southwest and the fault may be an impediment to groundwater flow within the Paso Robles and Careaga Formations.

2.3.2. Groundwater Flow Regime

Groundwater flows within the NMMA from recharge sources toward areas of groundwater discharge. Groundwater flow is controlled by:

- hydraulic head (e.g., recharge and pumping),
- barriers to flow (e.g., faults),
- preferential flow paths (e.g., buried gravel channel deposits), and
- geology (e.g., geologic facies contacts or leakage through fine grained beds).

Groundwater elevation hydrographs show measured groundwater elevations over time within the specific aquifers tapped by a well and are site-specific for specific times. Groundwater elevation measurements within an aquifer are mapped and interpreted to develop groundwater contours. Groundwater contour maps provide an interpreted understanding of the hydraulic head conditions within specific aquifer zones.

The following paragraphs present our current understanding of the groundwater flow regime. This understanding includes groundwater flow along the boundaries of the NMMA and groundwater flow within the NMMA.

Groundwater flow at the NMMA Boundary

The NMMA area encompasses only part of the Santa Maria Groundwater Basin. Groundwater flow between adjacent portions of the basin can be expected to occur, but less subsurface flow is likely to occur along bedrock basin edges than between areas where there is continuity of the aquifers.

The eastern boundary of the NMMA is approximately coincident with Nipomo Creek in Nipomo Valley. Groundwater recharge from the creek may occur through the shallow creek deposits but minimal subsurface inflow into the NMMA area occurs from the bedrock underlying the creek alluvium.

The northern boundary of the NMMA is coincident with the creek alluvium – Paso Robles Formation boundary within Los Berros Creek Valley. It is underlain by alluvium that receives recharge from Los Berros Creek which may be a significant source of groundwater recharge. Formations north of the Los Berros Valley include sedimentary deposits and underlying Franciscan Complex. Any groundwater flow from these formations to the NMMA is likely negligible.

The northwest boundary of the NMMA is at the base of the Mesa along the Cienega Valley of Arroyo Grande Creek. Groundwater flow across this boundary can occur, and may be impeded by the Oceano fault and the bedrock outcrop at Nipomo Hill. A cross section along the north edge of the Mesa was developed to aid in characterization of the subsurface geology (Figure 2-2). Hydrogeologic parameters have subsequently been used, along with groundwater level contour maps, to evaluate the amount of groundwater flow that occurs across this interface between the NMMA and the Northern Cities Management Area (see Section 5.2).

The southern boundary of the NMMA is at the base of the Mesa along the Santa Maria River Valley. Groundwater flow across this boundary can occur and may be impeded by the Oceano fault. A cross section along this boundary is being developed to aid in characterization of the subsurface geology. Hydrogeologic parameters can then be used, along with groundwater level contour maps, to estimate the amount of flow that occurs at this interface between the NMMA and the Santa Maria Valley Management Area.

The western boundary of the NMMA is a combination of the east-west R3 administrative line (San Luis Obispo County land use zoning) from the Cienega Valley to the coast and south along the coastline. Groundwater flow has historically occurred from land to the ocean across this boundary. This boundary is particularly important because a reversal of flow across this boundary may result in seawater intrusion.

Along the coastal portion of the NMMA, there is a potential for seawater intrusion to occur. The risk of seawater intrusion to NMMA water supply is a function of the groundwater level, the depth of the aquifers, the structural geology and stratigraphy, and the location of a seawater-fresh groundwater interface. It is not known if the principal aquifers are exposed on the seafloor along the coastal portion of the NMMA. The nearest known aquifer exposure on the seafloor occurs to the north of the NMMA area. A further risk of seawater intrusion to NMMA water supply could exist along vertical migration pathways in a near coastal zone. Seawater intrusion is minimized where offshore gradients exist, and could occur most rapidly if the onshore aquifers are pumped in excess of fresh water replenishment.

Groundwater flow within the NMMA

Groundwater flow within the NMMA is influenced by geologic features, and recharge and discharge points. Aquitards within the Nipomo Mesa restrict vertical groundwater flow particularly between the shallow and deep aquifers. Recharge sources include major point sources (Los Berros Creek, stormwater runoff basins and wastewater percolation ponds) and distributed recharge sources (septic systems, percolation of rainfall and irrigation return flows). Discharge locations include pumping wells, areas of surface outflow, and phreatophyte consumption.

Groundwater flow from the Los Berros Creek alluvium toward the Mesa can occur where the alluvium overlies or is in contact with the shallow and deep aquifers along the southern edge of the Los Berros Valley. A cross section along this alignment is being developed to aid in characterization of the subsurface geology. Hydrogeologic parameters can then be used, along with groundwater levels, to estimate the amount of flow that occurs at Los Berros Valley alluvium and Mesa basin sediments interface.

Faults have been identified by the California Department of Water Resources (2002) and by previous geological studies (Figure 2-1). These studies identify multiple faults that cross the NMMA. These faults have been interpreted to vertically displace the pre-Holocene geologic units. The overlying dune sands do not appear to be displaced along these faults. The faults could impede flow within basin sedimentary beds. Current seismic studies are being performed for Pacific Gas and Electric Company as mandated by the Nuclear Regulatory Commission for permitting operation of the Diablo Nuclear Power Plant. These studies can be expected to provide additional information that can be used to improve the definition of faulting in the NMMA.

Aquitards that influence vertical migration of groundwater between aquifers have varying thicknesses and hydraulic conductivities (Figure 2-3). A significant aquitard exists in some areas near the base of the dune sand deposits that confines groundwater in underlying aquifers. Locally groundwater may be perched above the aquitard. Some leakage is likely to occur where the aquitard hydraulic conductivity increases and thickness decreases. The extent and thickness of the aquitards have been defined based on well logs and correlations or inferred based on groundwater levels.

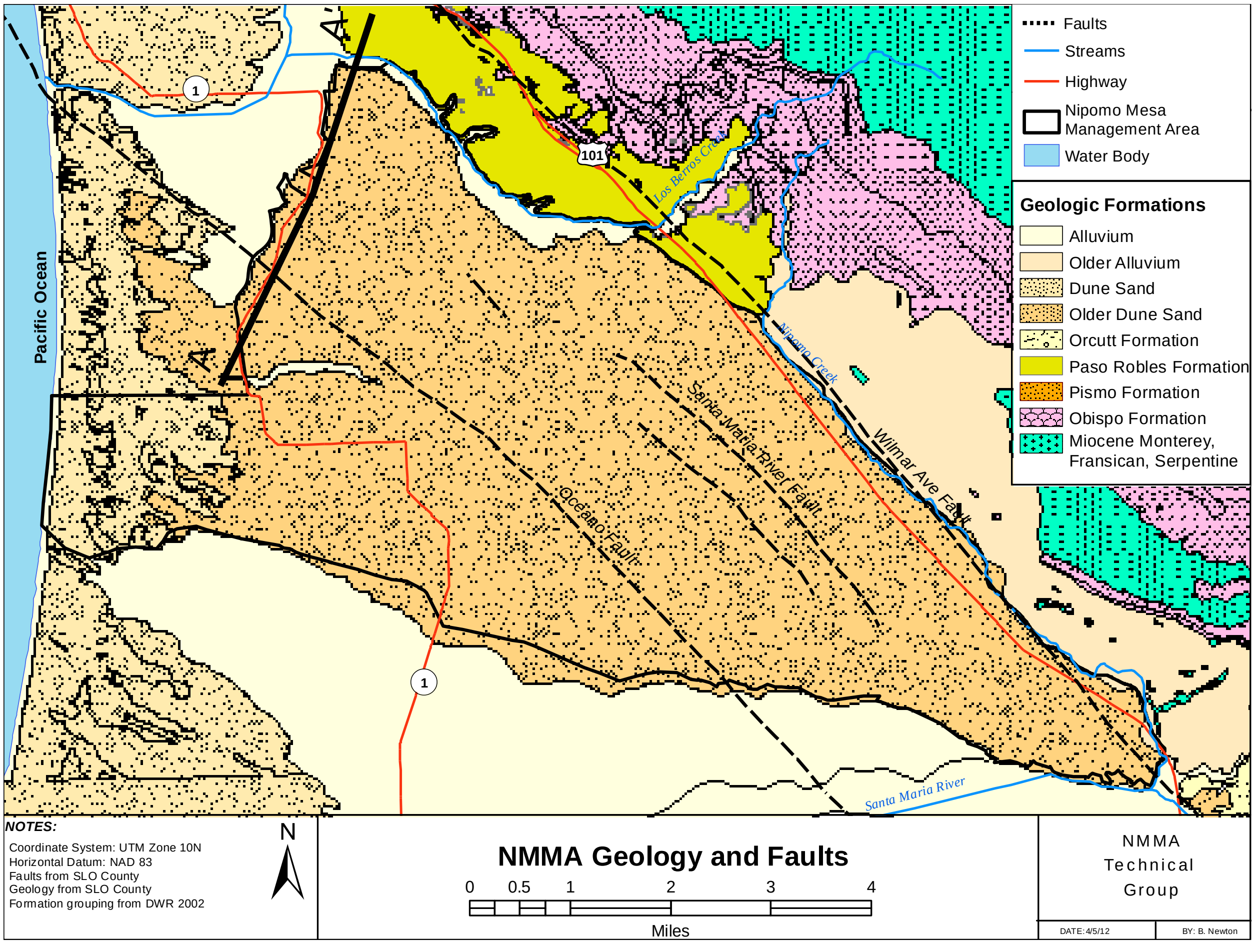

Figure 2-1. NMMA Geology and Faults

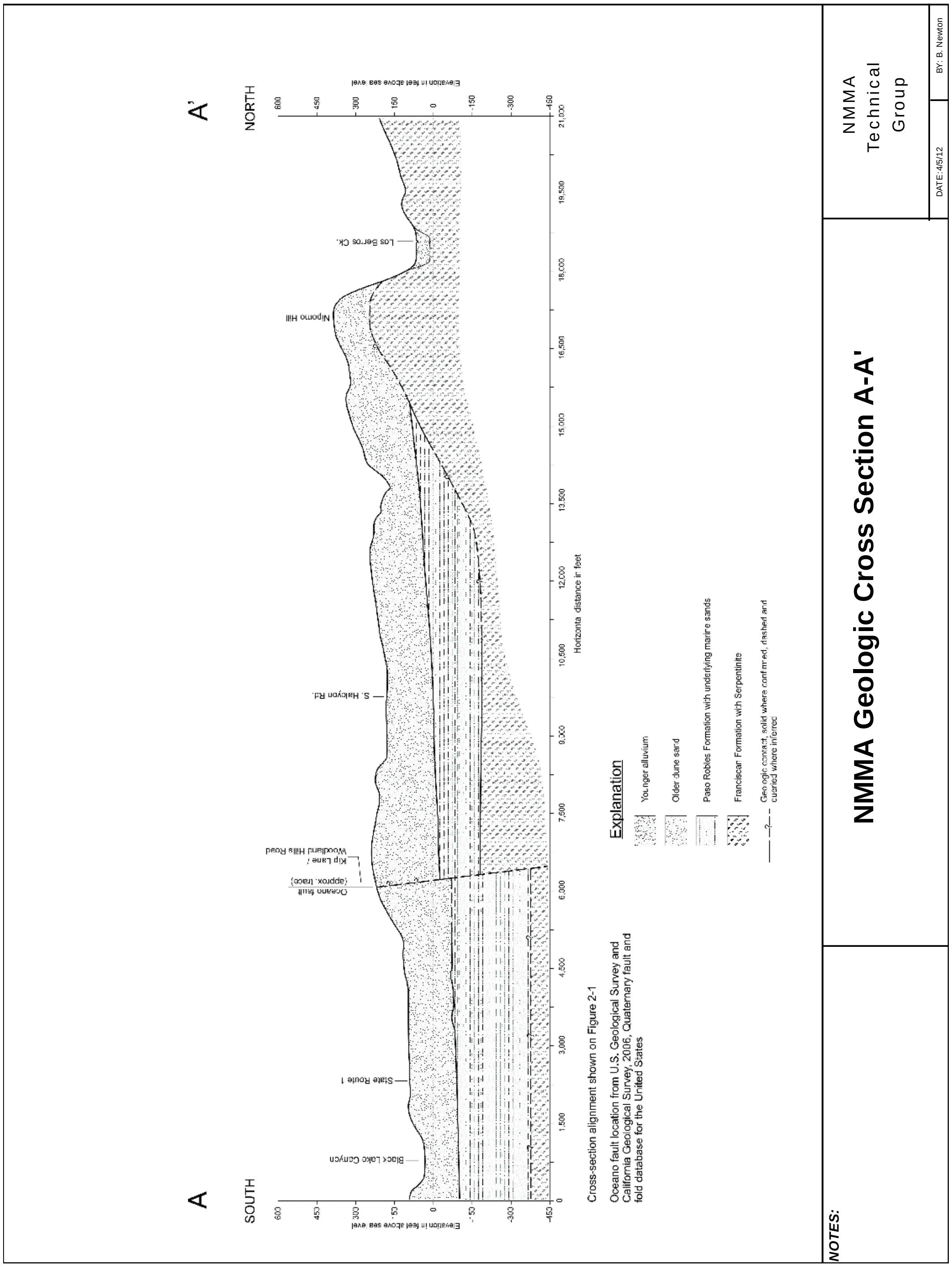

Figure 2-2. NMMA Geologic Cross Section A-A'

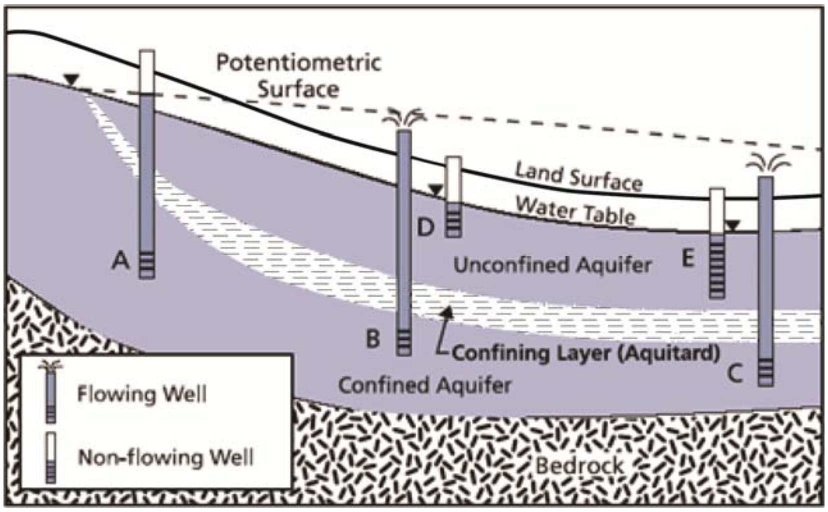

Figure 2-3. Schematic of Confining Layer and Confined Aquifer (Bachman et al., 2005)

3. Data Collection

The TG is monitoring and analyzing water conditions in the NMMA in accordance with the requirements of the Stipulation and Judgment. The Stipulating Parties are required to provide monitoring and other production data at no charge, to the extent that such data are readily available. The TG has developed protocols concerning measuring devices in order to obtain consistency with the Monitoring Programs of other Management Areas. Discussions of these subjects are presented in the following sub sections of this 4th Annual Report Calendar Year 2011.

3.1. *Data Collected*

The data presented in this section of the Annual Report was measured during the calendar year 2011 and is the subject of this Annual Report. Groundwater elevations, water quality, rainfall, surface water, land use, groundwater production and waste water discharge data were compiled and are presented in the following sections.

3.1.1. Groundwater Elevations in Wells

Groundwater elevation is determined by measuring the depth to water in a well from a reference point at the top of the well casing. The reference point and depth to water data are collected from each agency and input into a TG database that includes groundwater elevation determinations. The date, depth to water, measuring agency, pumping condition, and additional comments are recorded. When the database is updated with new data, an entry is posted in the database log describing the changes that have been made to the database. The groundwater elevation measurements are subjected to Quality Assurance Quality Control procedures adopted by the TG in part by reviewing historical hydrographs to determine if the measurements are within the historical range for the given well.

The accuracy of the groundwater elevations depends on measurement protocols, the reference point and local drawdown effects at that well. The TG surveyed the elevation for all the reference points at each Key Well in February of 2009. Additional elevation surveys for all monitoring program wells are scheduled for the continued improvement of groundwater elevations accuracy. Furthermore, protocol standards were developed by the TG regarding the length of time for well shut down before a groundwater elevation measurement is taken, and a notation of whether nearby wells are known to be concurrently pumping.

Depth-to-water measurements were collected in the April and October of 2011 by the County of San Luis Obispo. In addition Nipomo Community Services District, ConocoPhillips, Woodlands, Golden State Water Company, Cypress Ridge Golf Course, and the USGS collected depth-to-water measurements in calendar year 2011 (Figure 3-1, Figure 3-2).

3.1.2. Water Quality in Wells

Water quality of the NMMA and adjacent areas is summarized from a wide range of data sources, including:

- California Department of Public Health water quality records of water supply system groundwater sources;
- Regional Water Quality Control Board waste discharge reports, site assessments, remediation project reports and related materials;
- State Water Resources Control Board site assessments, remediation project reports and related materials (GeoTracker database);
- California Department of Toxic Substances Control site assessments and related materials;
- US Geological Survey ambient groundwater monitoring program (GAMA) data and reports; and
- Other NMMA groundwater production monitoring data.

Data reported in this Annual Report are derived from samples obtained using standard professional sampling protocols and analyzed at certified laboratories. The TG maintains these data in a digital database. In the NMMA, historical data from approximately 200 wells can be used to map groundwater quality conditions in both the Shallow and Deep aquifers. In some cases, water quality records consist of only one or two sampling events from a well, and with only a few water quality parameters, such as total dissolved solids or chloride. In other cases such as wells within the potable water systems, regular groundwater quality testing for a wide range of constituents is conducted.

Groundwater quality in wells near the ocean is of considerable importance because this is the most likely site where any intrusion of seawater would first be detected. Coastal nested monitoring well site 11N/36W-12C (west of the ConocoPhillips refinery; Figure 1-3) is monitored under agreement with SLO County and is scheduled to provide quarterly water quality sampling of general mineral and physical water quality constituents subject to access constraints for the protection of endangered species. In addition to monitoring this coastal site for water quality, the TG has pursued ways of updating coastal monitoring near the former nested well site 13K2-K6 adjacent to Oso Flaco Lake.

Locally, shallow groundwater quality is impacted by high concentrations of total dissolved solids, chloride and nitrate, and two municipal supply wells are known to require treatment or blending because of high nitrate concentrations. No other contaminants are known to impact local use of groundwater supplies for domestic or irrigation purposes.

3.1.3. Rainfall

There are six active rainfall gauges available to estimate the NMMA rainfall (Figure 3-4). Three stations are part of the ALERT Storm Watch System, Nipomo East (728), Nipomo South (730), and Oceano (795). One station is a California Irrigation Management Information System (CIMIS station), CIMIS (202). The other two stations are active volunteer gauges and include Mehlschau (38), and Nipomo CDF (151.1). The data are collected by the County of San Luis Obispo Department of Public Works (SLO DPW) and CIMIS. The TG obtains these data by filing a data request with County Public Works at the beginning of the calendar year for the rainfall data from the preceding year. SLO DPW staff collects volunteer gauge data once each year in the month of July for the previous year, July through June. Rainfall data are often compiled on a water year basis. A water year typically begins October 1st and ends September 30st of the following year, and the year referenced is that of September (i.e., WY2003 is defined as October 1, 2002, through September 30, 2003). For the volunteer gauges, data collected from July 2011 to December 2011 is unavailable until July 2012, when County staff collects and compiles the rainfall data.

The WY2011 rainfall totals are approximately 180 percent of the long-term average (Table 3-1). The next water year ending September 30th, 2012, will be likely less than the long-term average. Reference evapotranspiration for calendar year 2011 is 43.6 inches, as compared to 41.7 inches in calendar year 2010.

Table 3-1. Rainfall Gauges and 2011 Rainfall Totals

Rainfall Station	Period of Record	Period of Record Mean	Water Year 2011[1]	Calendar Year 2011	Percent of Normal[2]
Nipomo East (728)	2005-2011	18.01	30.27	16.61	191%
Nipomo South (730)	2005-2011	16.70	27.25	13.98	172%
Oceano (795)	2005-2011	14.63	23.57	12.87	149%
CIMIS Nipomo (202)	2006-2011	14.36	27.18	16.54	171%
Nipomo CDF (151.1)	1958-2011	15.87	34.05*	NA	215%
Mehlschau (38)	1920-2011	16.83	28.91*	NA	182%

Notes:
NA - Data not available from July 2011 to December 2011 until July 2012.
1. Water Year is defined as Oct. 1 of previous year through Sept. 30 of the current year.
2. Percent of Normal, calculated using the period of record annual averages for #151.1.
* Voluntary gauge data collection occurs in July of each year, and rainfall is assumed to be zero for the remainder of the WY (July, August, and September).

3.1.4. Rainfall Variability

Quantifying the temporal and spatial variability is critical where rainfall is a large portion of the water supply. Spatial variability in the volume of rainfall across the NMMA is apparent when comparing the WY2011 rainfall totals from these gauges. The WY2011 total rainfall ranges from 23.6 inches (Nipomo South #795) to 34.0 inches (Nipomo CDF #151).

Climatic trends and interannual variability also impact the water supply to the NMMA. The cumulative departure from the mean was prepared for two rain gauge stations Mehlschau (38) and

Nipomo CDF (151.1) over the period from water year 1975 to water year 2011 (Figure 3-5). Periods of wetter than average and drier than average conditions are coincident at both gauges. The most pronounced dry period occurred from 1983 to 1994, followed by a wetter than average period from 1994 to 1998. A more recent dry period occurred from 2001 to 2009, with 2005 and 2006 being wetter than average. Since 2010, wet conditions have occurred.

3.1.5. Streamflow

Currently, there are some records of streamflow within the NMMA. On Los Berros Creek, the Los Berros 757 streamflow sensor is located 0.8 miles downstream from Adobe Creek and 3.7 miles north of Nipomo on Los Berros Road and the Valley Road (Sensor 731) is located on at the Valley Road bridge over Los Berros Creek (Figure 3-6). The data at the Los Berros gauge are compiled by San Luis County Department of Public Works. Nipomo Creek streamflow is not currently gauged.

3.1.6. Surface Water Usage

There are no known diversions of surface water within the NMMA.

3.1.7. Surface Water Quality

Surface water quality samples were taken in Nipomo Creek in 2001 and 2002 and in Los Berros Creek in 2002 and 2003 for the Central Coast Ambient Monitoring Program (www.ccamp.org). Nipomo Creek was listed as an impaired water body because of fecal coliform counts in exceedance of the basin plan standard. There are no known surface water quality samples taken since the CCAMP sampling.

3.1.8. Land Use

Land use data historically has been collected for the NMMA by the DWR at approximately ten year intervals since 1959. DWR periodically performs land use surveys of the Southern Central Coast area (which includes the NMMA). The TG will decide when the next land use survey should be completed. Ideally, DWR will update the land use for the South Central Coast area (which includes the NMMA) in the future for the next land use survey. The status of the DWR land use program for the Southern District can be accessed at (http://www.dpla.water.ca.gov/sd/land_use/landuse_surveys.html).

The most recent DWR Land Use survey that covers the NMMA was in 1996. The 2007 NMMA land use was classified by applying the DWR methodology to a June 2007 one-foot resolution aerial photograph. Land use was classified into four main categories based on the methodology used by DWR in 1996; agriculture, urban, golf course and native vegetation (undeveloped lands).

Agricultural lands for 2009 were further subdivided using the San Luis Obispo County Agriculture Commissioner survey of the 2009 crop types and acreage for San Luis Obispo County. The major crops grown on in the NMMA are strawberries, vegetable rotational, avocados, and nursery plants.

Urban lands were classified following the DWR methodology with additional sub categories based on San Luis Obispo County land use categories from land use zoning maps. The categories for urban include (1) Commercial-Industrial; (2) Commercial-office, (3) Residential Multi-family; (4) Residential-Single Family; (5) Residential-Suburban; (6) Residential-Rural; (7) Recreational grass; (8) Vacant. Golf courses were classified separately from Agricultural or Urban Lands.

Native vegetation lands were classified following the 1996 DWR methodology. In the DWR methodology, all undeveloped land was classified as native vegetation and includes groves of non-native eucalyptus and fields of non-native grasses. The lands classified as native vegetation were further broken down into two categories: grasses; and trees and shrubs; to better estimate deep percolation of rainfall required for the hydrologic inventory (see Section 5 Hydrologic Inventory).

The land use acreage for Urban is 10,246 acres; for Agriculture is 2,587 acres; and for Native is 8,314 acres. Sub categorical land use acreage is also defined and will subsequently be utilized to compute the groundwater productions and consumptive use of water for each subcategory (Table 3-2).

Table 3-2. Land Use Summary

Land Use Category	Year of Data	Acreage
Urban		
Commercial – Industrial	2007	472
Commercial – Office	2007	118
Golf Course	2007	549
Residential Multi-family	2007	24
Residential Single Family	2007	821
Residential Suburban	2007	3,597
Residential Rural	2007	4,629
Recreational grass	2007	36
Urban Total	**2007**	**10,246**
Agriculture		
Deciduous	2009	2
Pasture	2009	2
Vegetable rotational	2009	225
Avocado and Lemons	2009	277
Strawberries	2009	1,393
Nursery	2009	332
Non-irrigated farmland	2007	356
Agriculture Total	**2007**	**2,587**
Native Vegetation		
Fallow Ag Land	2007	234
Native Trees and Shrubs	2007	2,657
Native Grasses	2007	4,579
Urban Vacant	2007	765
Water Surface	2007	9
Unclassified	2007	70
Native Total	**2007**	**8,314**
Total Land Use		**21,147**

3.1.9. Groundwater Production (Reported and Estimated)

The groundwater production data presented in this section of the Annual Report were collected for calendar year 2011. Where groundwater production records were unavailable, the groundwater production was estimated for calendar year 2011 (Figure 3-7).

Reported Groundwater Production

Individual landowners, public water purveyors, and industry all rely on groundwater pumping from the aquifers underlying the NMMA. Data were requested by the TG from the public water purveyors and individual pumpers and incorporated in this calendar year 2011 Annual Report. Stipulating Parties to the Judgment are required to provide monitoring and other production data at no charge, to the extent that such data have been generated and are readily available.

Stipulating parties provided production records that report a total of 6,223 acre feet (AF) of groundwater produced in calendar year 2011 (Table 3-3) , an increase of 123 AF from last year. NCSD, Woodlands, and RWC increased production in 2011 compared to 2010. Woodlands increase in production is consistent with the planned build-out of the development. GSWC production is lower this year as compared to last year.

Table 3-3. Calendar Year 2011 Reported Groundwater Production

Stipulating Parties	Production (AF/yr)
NCSD	2,488
GSWC	1,043
Woodlands	864
ConocoPhillips	1,100
RWC	728
Subtotal	**6,223**

Estimated Production

The estimated production for agricultural crops in the NMMA is 2,465 AF computed on a daily time-step by multiplying the crop area and the crop specific water demand met by either soil moisture, rainfall, or groundwater production, thus developing the unit production for calendar year 2011 (Table 3-4). A detailed explanation of the methodology used for this estimate is provided in Appendix E, Table 1.

Table 3-4. 2011 Estimated Groundwater Production for Agricultural

Crop Type	2011 Area (Acres)	2011 Unit Production (AF/acre)	2011 Production (AF/yr)
Deciduous	2	2.0	4
Pasture	2	2.5	5
Vegetable Rotational	225	1.9	437
Avocado and Lemon	277	1.2	320
Strawberries	1,393	1.0	1341
Nursery	332	1.1	358
Un-irrigated Ag Land	356	0.0	0
Total	**2,587**		**2,465**

Estimated groundwater production for urban use was estimated for rural landowners not served by a purveyor. The total estimated production for the rural landowners is 1,850 AF for calendar year 2011 (Table 3-5).

Table 3-5. Estimated Groundwater Production for Rural Landowners

Land Use Type	Water Use Area (acres)	Unit Production (AF/acre)[1]	Production (AF/yr)
Golf Course	549	1.4	762
451RS Zoned Parcels	172	2.6	452
616 RR Zoned Parcels	243	2.6	637
Total	**414.75**		**1,850**

Note:

1. Unit production values from NCSD 2007, Water and Sewer Master Plan Update

Combining the estimates of groundwater production for Stipulating Parties (Table 3-3), for Agriculture (Table 3-4) and Rural Landowners (Table 3-5) results in an estimated total groundwater production of 10,538 AF for calendar year 2011 (Table 3-6).

Table 3-6. 2011 Measured and Estimated Groundwater Production (AF/yr)

Measured	
NCSD	2,488
GSWC	1,043
Woodlands	864
ConocoPhillips	1,100
RWC	728
Subtotal	**6,223**
Estimated	
Rural Landowners	1,850
Agriculture	2,465
Total NMMA Production	**10,538**

3.1.10. Wastewater Discharge and Reuse

Five wastewater treatment facilities (WWTF) discharge treated effluent within the NMMA: the Southland Wastewater Works (Southland WWTF), the Blacklake Reclamation Facility (Blacklake WWTF), Rural Water Company's Cypress Ridge Wastewater Facility (Cypress Ridge WWTF), the Woodlands Mutual Water Company Wastewater Reclamation Facility (Woodlands WWTF) (Figure 3-8). The Golden State Water Company La Serena Groundwater Manganese Removal Treatment Plant (La Serena) discharges filter backwash to percolation ponds. The total waste water discharge in the NMMA was 780 AF for calendar year 2011 (Table 3-7).

Table 3-7. 2011 Wastewater Volumes

WWTF	Influent (AF/yr)	Estimated Effluent (AF/yr)	Re-use
Southland	711	629 (1)	Infiltration
Blacklake	71	61 (1)	Irrigation
Cypress Ridge	Not Reported	44	Irrigation
Woodlands	Not Reported	40	Irrigation
La Serena	Not Reported	6 (2)	Infiltration
Total		**780**	

Notes:
1. Effluent was estimated as the sum of Influent - Evaporation from Aeration Ponds - 10% of Influent to account for biosolid removal. For the Nipomo Mesa calendar year 2011, the annual evapotranspiration measured at CIMIS 202 gage is 43.6 inches and the rainfall measured at CIMIS 202 gage is 16.54 inches (CIMIS, 2011). This results in a net evaporation from a pond of 27.06 inches per year.
2. GSWC's La Serena Groundwater Manganese Removal Treatment Plant treats water from GSWC's La Serena and Eucalyptus wells. Filter backwash water is discharged to percolation ponds, where water infiltrates into the basin.

3.2. *Database Management*

The database of monitoring data is an entirely digital database and is maintained in Microsoft Excel as a confidential document. The database is broken into five datasets: Groundwater elevation, groundwater production, wastewater treatment, stream flow, groundwater quality, climate, and land use.

NCSD's technical representative is currently designated as the database steward and is responsible for maintaining and updating the digital files and for distributing any updated files to other members of the TG. A "change log" is maintained for each database. The date and nature of the change, along with any special features, considerations or implications for linked or related data are recorded in the change log. The Stipulation and Judgment require that absent a Court order or written consent, the confidentiality of well data from individual owners and operators is to be preserved.

3.3. *Data and Estimation Uncertainties*

Uncertainties exist in data, and therefore uncertainties exist in derivatives of data including interpretations and estimations made from direct measurements. Uncertainties arise from errors in measurements, missing measurements, and inaccurate methodologies and generalizing assumptions. For example, rainfall is measured at a few locations across the NMMA. However, it is well known that the spatial and temporal variability in rainfall deposition in a storm is much greater than that which the density of rainfall gauges can represent. Ground surface elevation across the NMMA is known to be in error at places and may be reported incorrectly by amounts as large as 20 feet. This affects the accuracy of groundwater elevations and contours. There exists missing data from both groundwater elevations and rainfall records. Estimations are made to fill in these data gaps with the understanding that the accuracy of these estimates is reduced. Derivatives from these data therefore contain inaccuracies. Additionally, precision issues arise when interpretations are made from data, in that individuals make decisions during the process of interpreting data that are subjective and therefore not documentable. For example, aerial image classification is a subjective process as is the preparation of groundwater elevation contours. Estimations are made for parameters that are not measurable or very difficult to measure. The methodologies used to make estimates represent a simplified numerical representation of the environment and are based on assumptions defining these simplifications. Quantifying the uncertainty in data or data derivatives is a rigorous and ongoing process.

The measured groundwater production values are reliable and are considered precise to the tens place for NCSD, GSWC, and Woodlands, RWC and the hundreds place for ConocoPhillips. The estimated production values are less reliable and precise for the rural residence groundwater production. The unit production factors used to estimate the rural residence groundwater production were developed for the NCSD Water and Sewer Master Plan (see Section 3.1.8 Land Use). For the estimated agricultural production, there is no measured data available in the NMMA to verify the precision or reliability of the agricultural production.

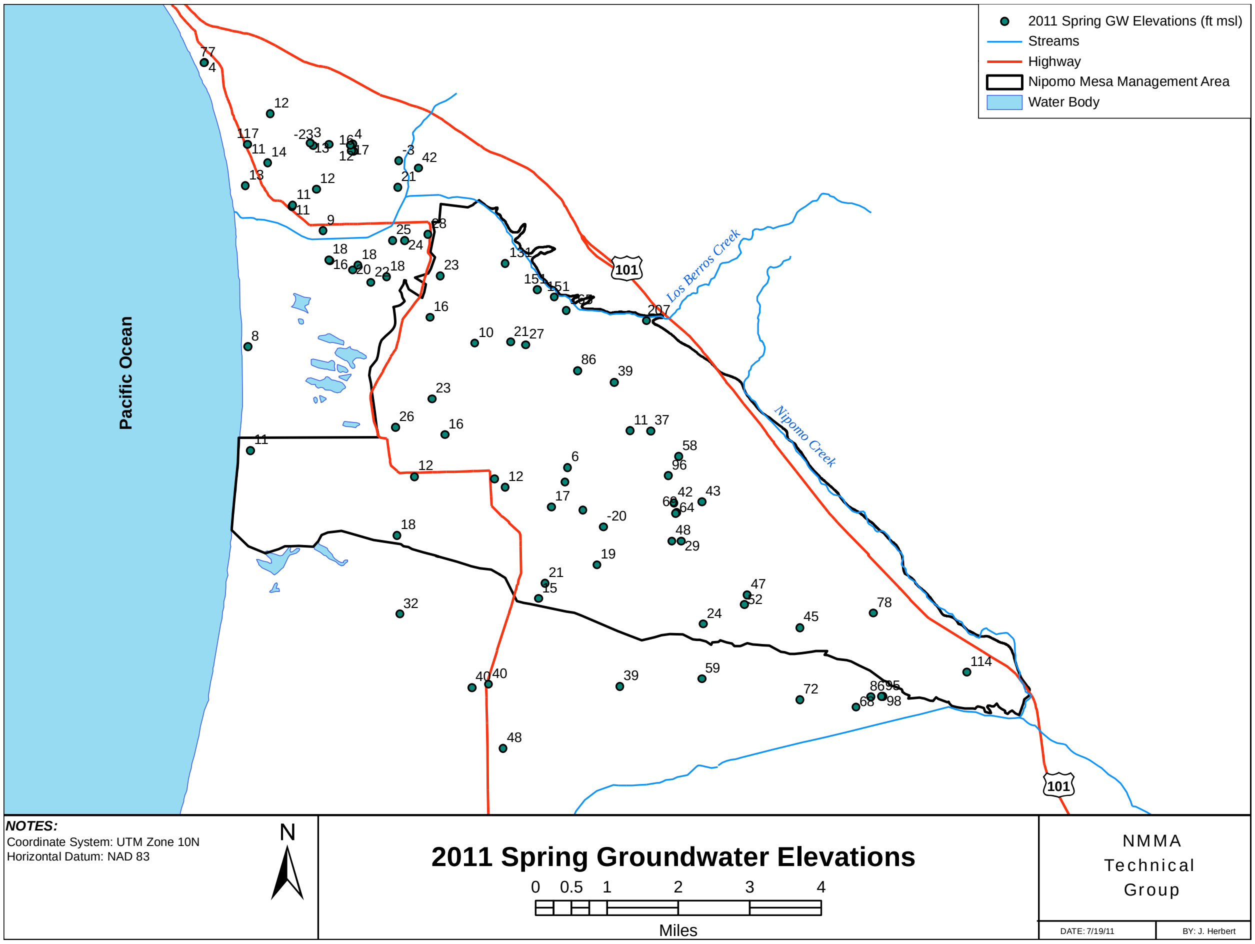

Figure 3-1. 2011 Spring Groundwater Elevations

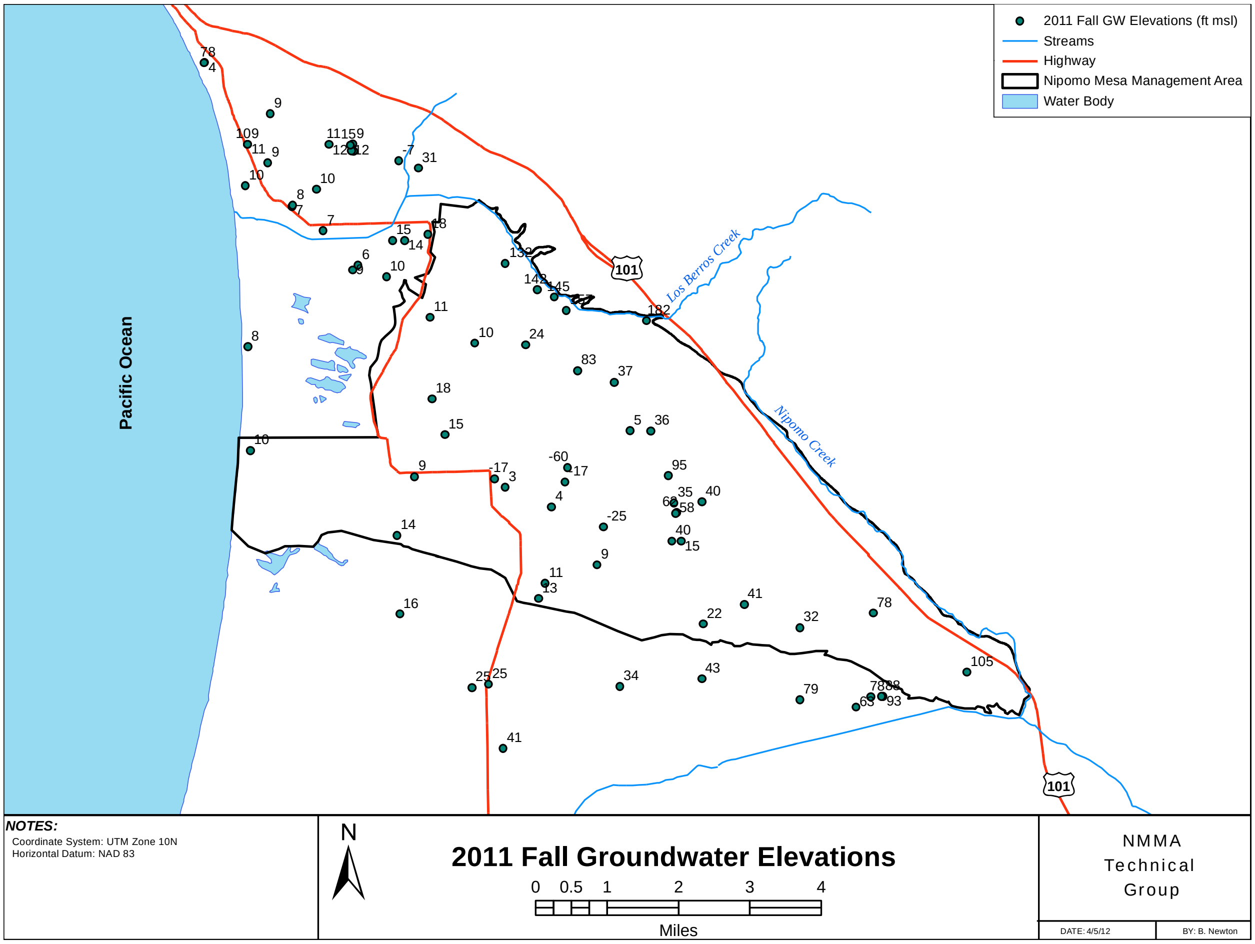

Figure 3-2. 2011 Fall Groundwater Elevations

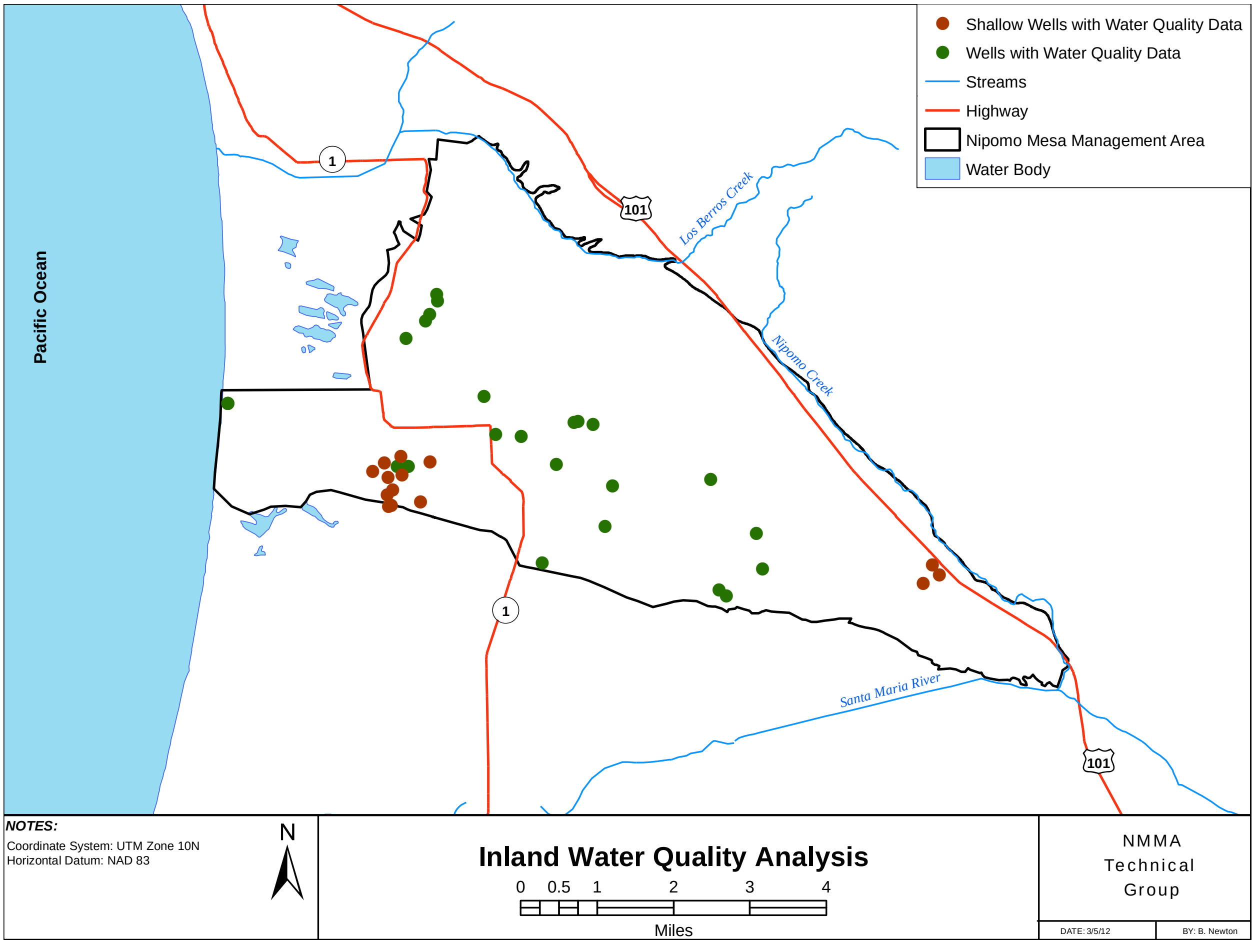

Figure 3-3. Locations of Water Quality Data

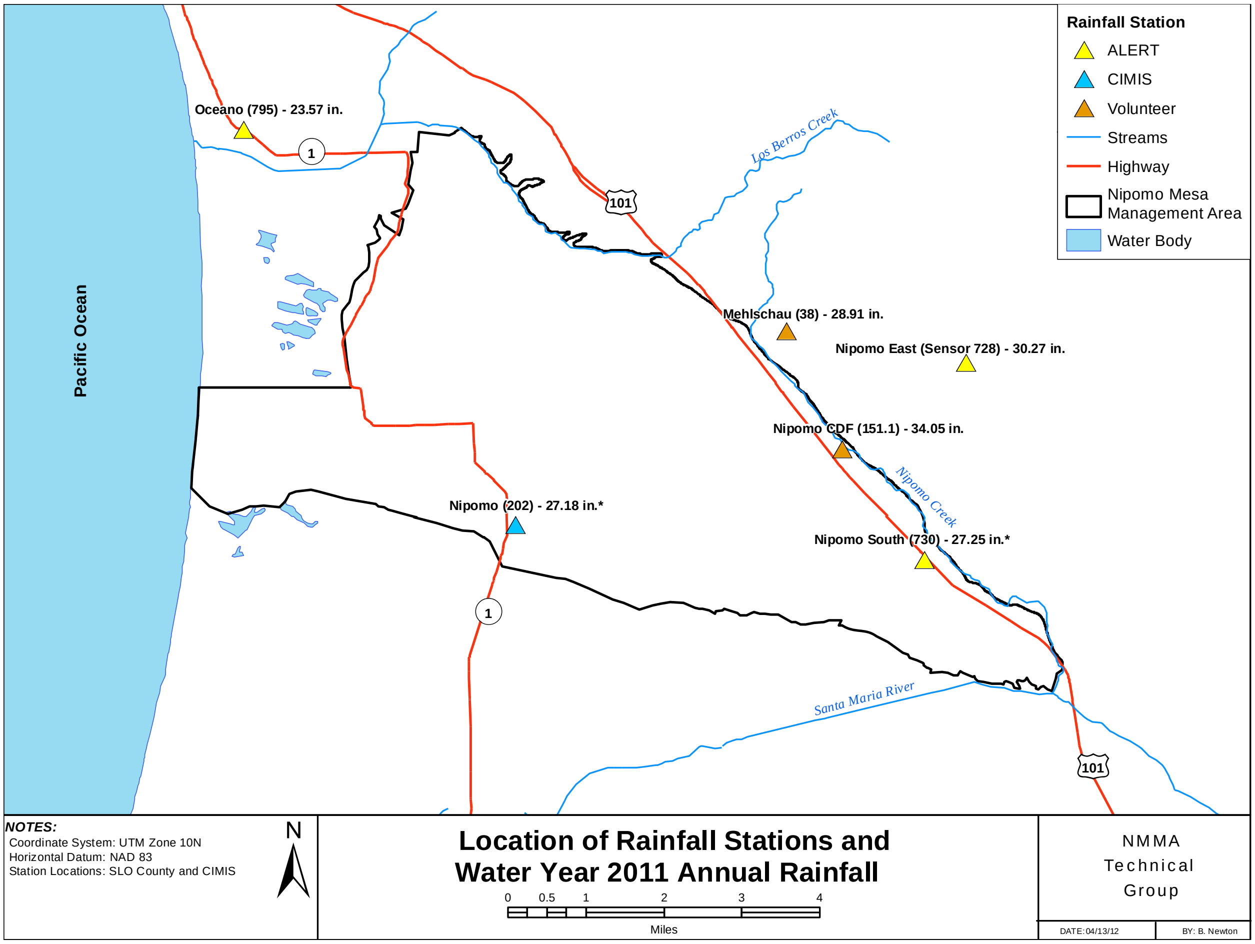

Figure 3-4. Rainfall Station Location and Water Year 2011 Annual Rainfall

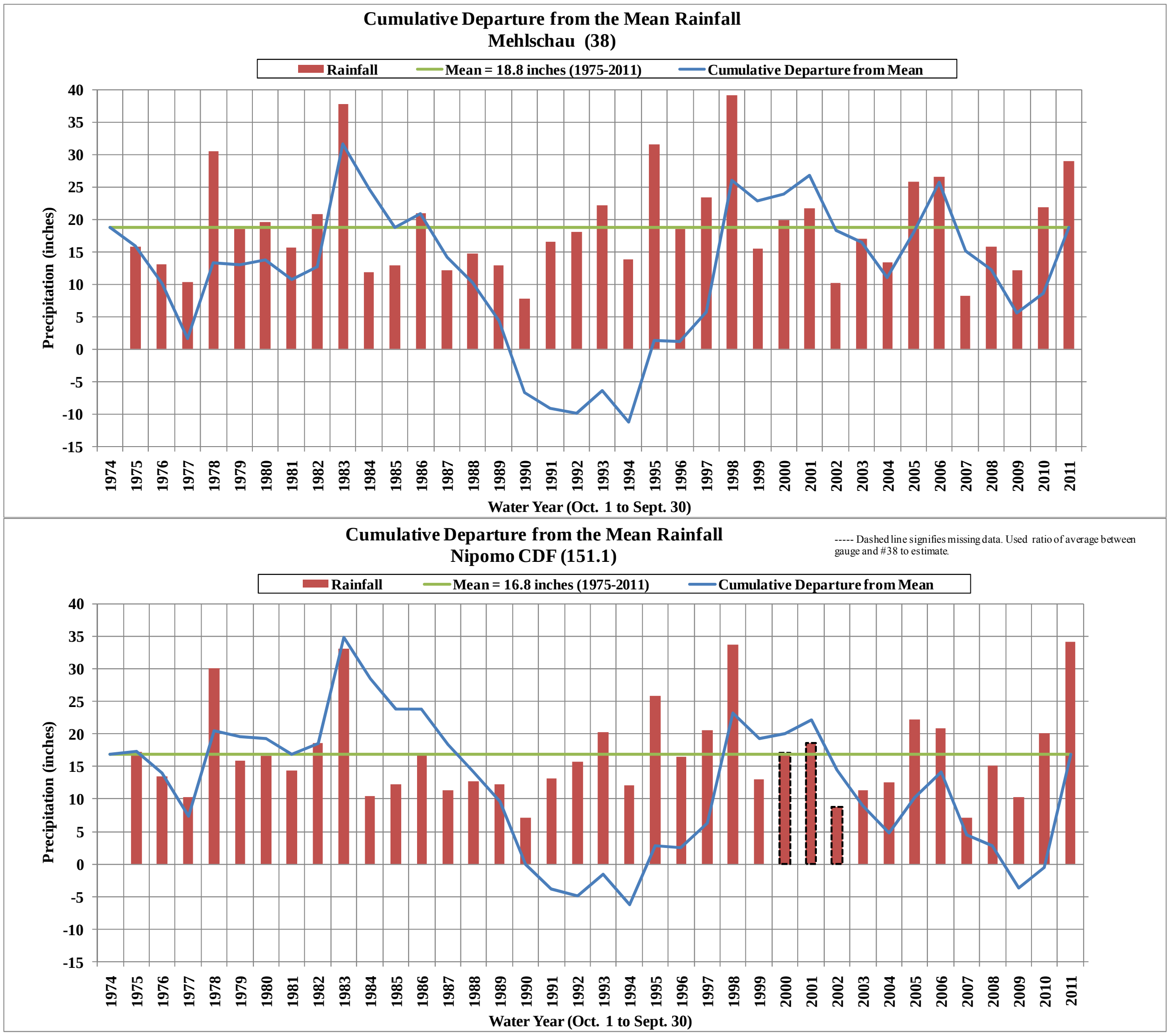

Figure 3-5. Cumulative Departure from the Mean for the following rain gauges: Mehlschau (38) and Nipomo CDF (151.1)

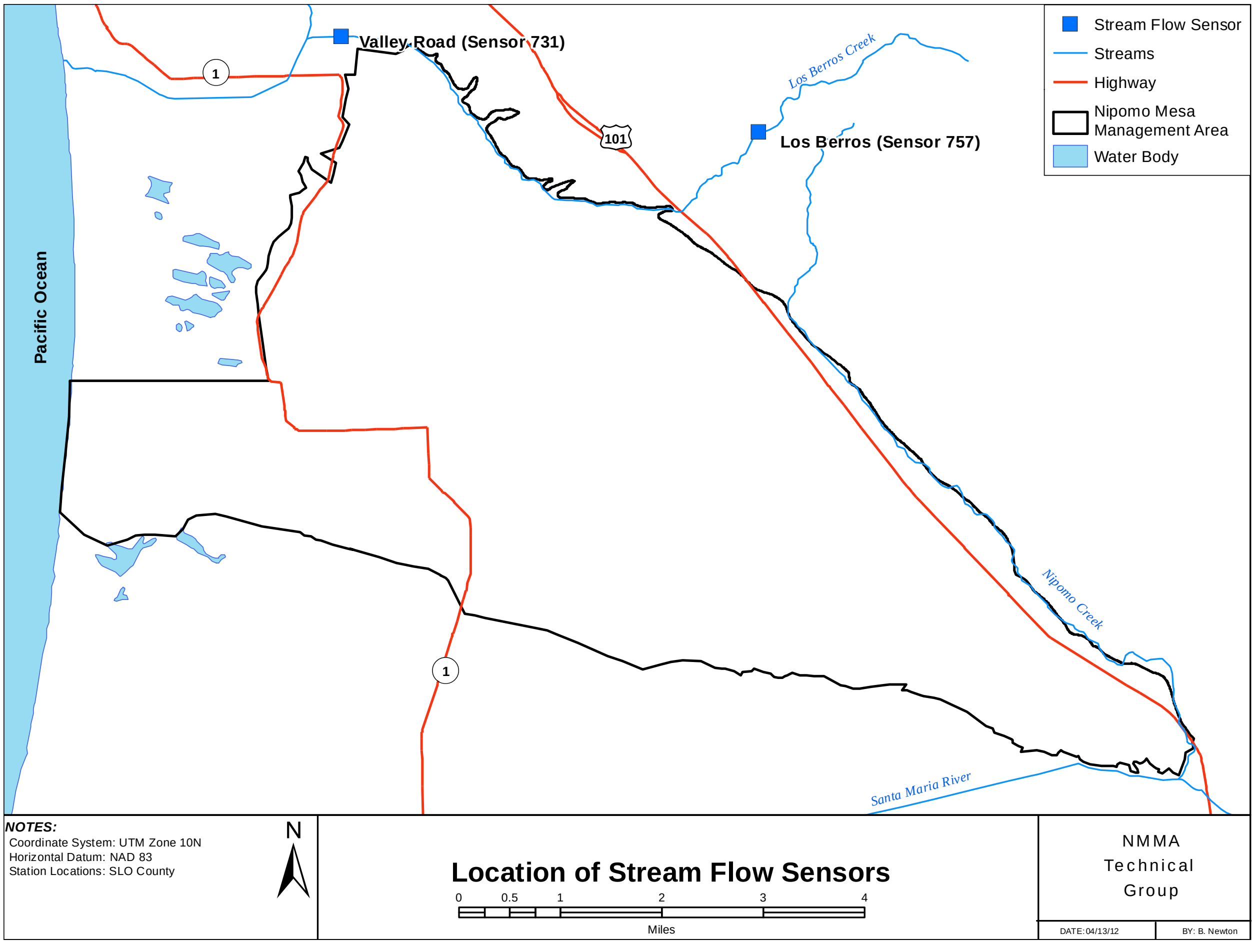

Figure 3-6. Location of Stream Flow Sensors

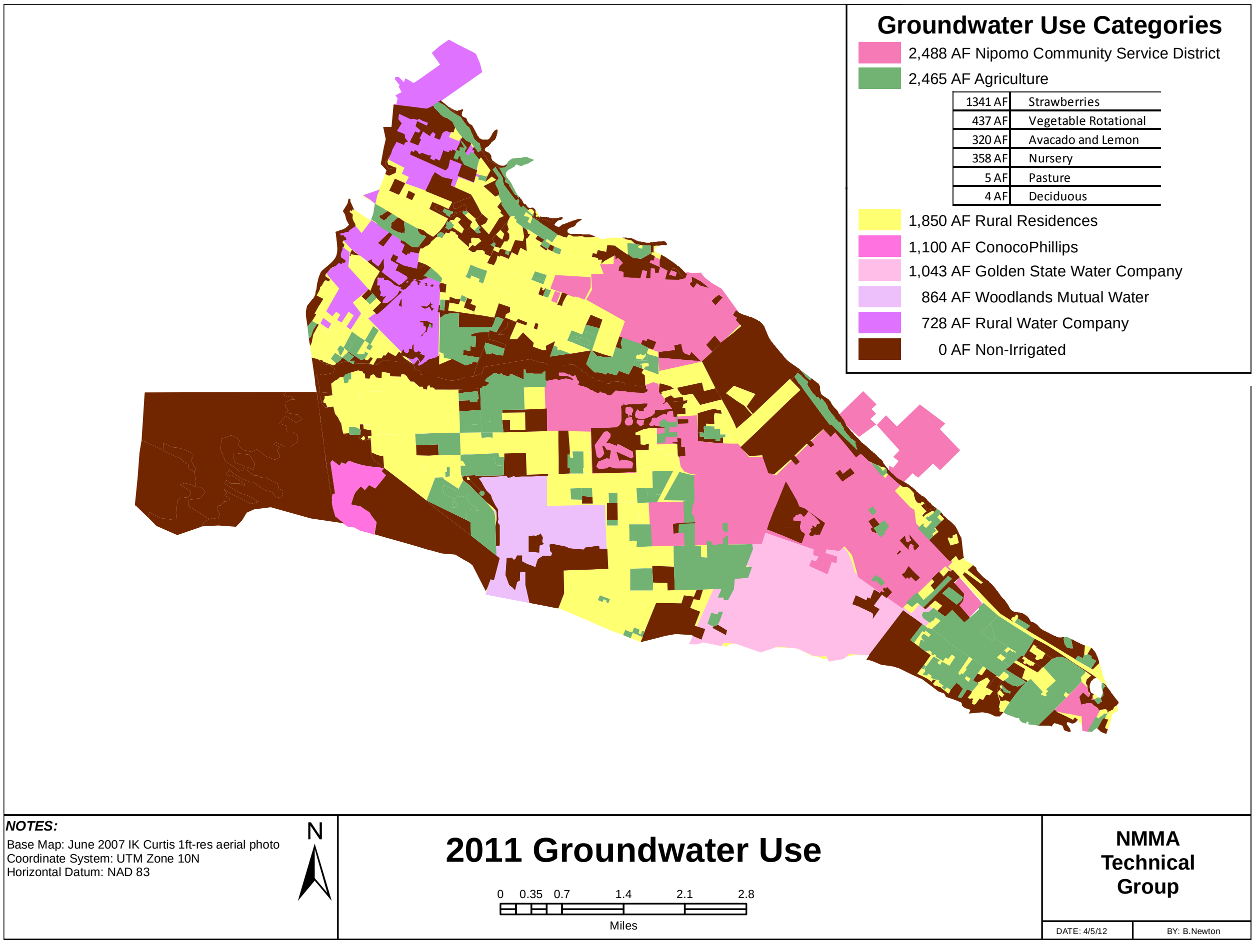

Figure 3-7. 2011 Groundwater Use

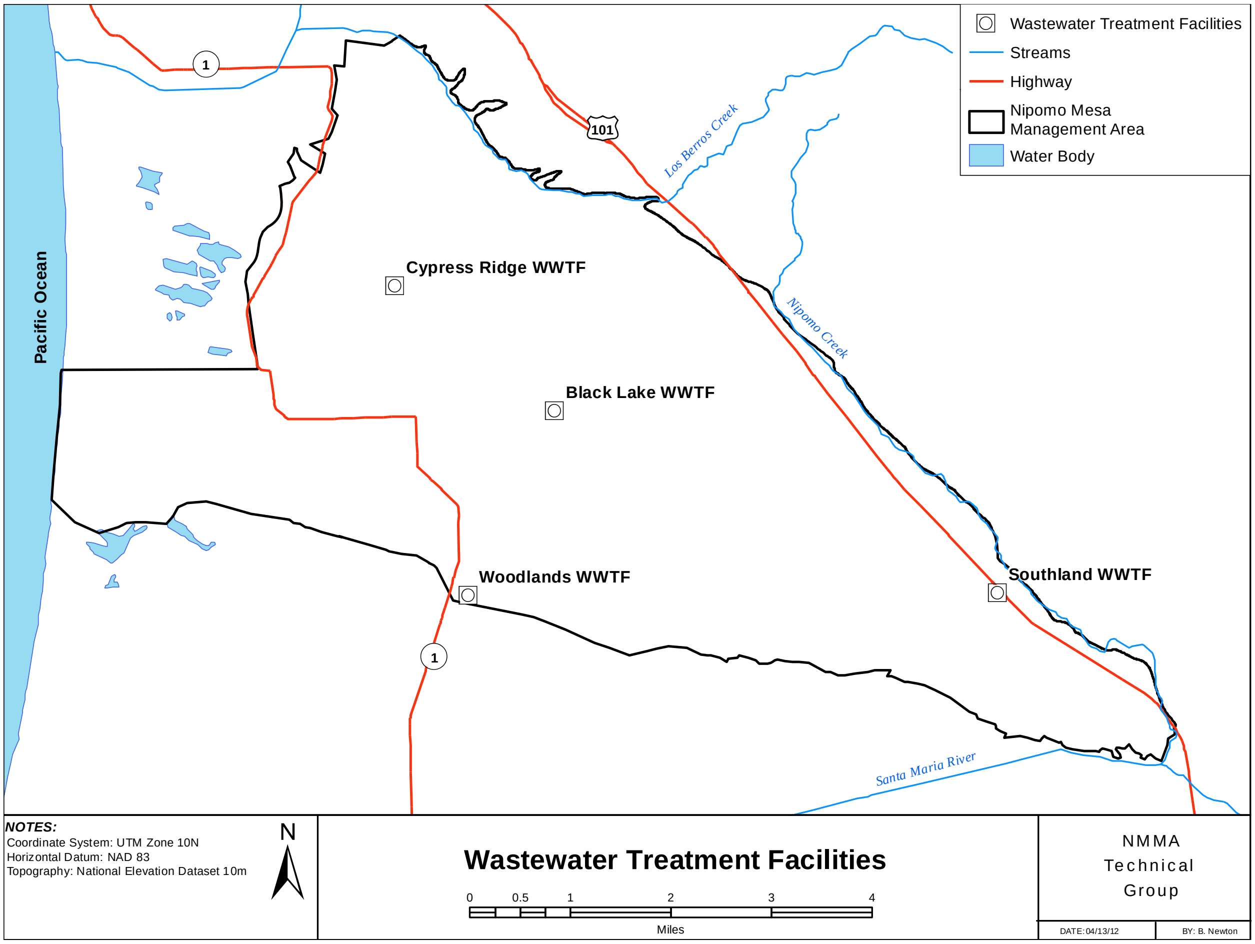

Figure 3-8. Wastewater Treatment Facilities

4. Water Supply & Demand

Presented in this section are discussions of the various components of current and projected estimates of water supplies and demands for the NMMA.

4.1. *Water Supply*

The water supplies supporting the activities within the NMMA are met primarily from groundwater production with a minor amount of recycled water. No surface water diversions exist, nor is there currently any imported water. Supplemental Water, as defined by the Stipulation, is being developed and delivery is expected within the next few years. A brief description of the groundwater production, recycled water, Supplemental Water, and surface water diversion is presented in the following sections.

4.1.1. Groundwater Production

Currently, groundwater pumping is not differentiated between various strata, shallow or deep aquifers. The specifics of shallow and deep aquifer production are better known by the TG for purveyor wells which produce primarily from the deep aquifers, but this information is not available for many more private wells in the NMMA.

Shallow Aquifers

Domestic production by rural landowners was estimated to be about 1,089 AF/yr (see Table 3-5. Estimated Groundwater Production for Rural Landowners). The majority of this production may be from the Shallow Aquifers. A portion of the estimated 2,465 AF agricultural pumping may also be from the Shallow Aquifers.

Deep Aquifers

All production from wells used for public drinking water and industrial water is likely pumped from the Deep Aquifers (primarily the Paso Robles Formation). This pumping is estimated to be about 8,073 AF (see Table 3-4 and Table 3-5). In addition, a portion of the estimated 2,465 AF/yr of agricultural pumping may also be produced from the Deep Aquifers.

4.1.2. Recycled Water

Wastewater effluent from the golf course developments at Blacklake Village, Cypress Ridge, and Woodlands is recycled and utilized for golf course irrigation. The amount of recycled water used in calendar year 2011 for irrigation at Blacklake Village, Cypress Ridge and Woodlands are 61 AF, 44 AF, and 40 AF, respectively (see Section 3.1.10 Wastewater Discharge and Reuse).

4.1.3. Supplemental Water

There was no Supplemental Water delivered to the NMMA in calendar year 2011.

4.1.4. Surface Water Diversions

There are no known surface water diversions within the NMMA.

4.2. *Water Demand*

The water demands in the NMMA include urban (residential, commercial, industrial), golf course, and agricultural demands. The TG used a variety of methods to estimate the water demands of the respective categories (see Section 3.1.9 Groundwater Production (Reported and Estimated)).

4.2.1. Historical Demand

The historical demand estimated for urban (including golf course and industrial) and agricultural land uses has been steadily increasing since 1975 with urban accounting for the largest increase in total volume and percentage (Figure 4-1).

4.2.2. Current Demand

The estimated demand is 10,538 AF for Calendar Year 2011, based on annual groundwater production records provided by the water purveyors on the Nipomo Mesa, an estimated groundwater production by land use area (see Section 3.1.8 Land Use), and recycled water use (see 3.1.10 Wastewater Discharge and Reuse). This amount of demand represents a decrease of 412 AF from the previous year, as reported in the 3rd Annual Report Calendar Year 2010. The TG has not differentiated the causes of this reduction; possible causes include reduced potential evapotranspiration and increased rainfall, conservation measures, and economic forces.

4.2.3. Potential Future Production (Demand)

The projected future demand for NCSD is an increase from 2,293 AF/yr in calendar year 2010 to 3,400 AF/yr in 2030 (NCSD, UWMP 2010 – Table 21 and 23). The ConocoPhillips refinery expects future production to be similar to recent years' production amounts of approximately 1,200 AF/yr. The projected water demand for Woodlands at build-out according to the Woodlands Specific Plan EIR is 1,600 AF/yr (SLO, 1998). The projected water demand for the GSWC at full build-out of current service area is estimated to potentially increase to approximately 1,940 AF/yr in 2030 (GSWC, 2008). Currently, no estimate of potential future production for agriculture has been developed. Future production from the Groundwater Basin is restricted by San Luis Obispo County Ordinance §3090 (adopted May 2006) which provides that Land Divisions authorized by the current South County Area Plan (Inland) pay a supplemental water charge Not-to-Exceed $13,200 for each dwelling unit equivalent and further provides that future General Plan Amendments will not be approved unless supplemental water to offset the proposed development's estimated increase in non-agricultural demand has been specifically allocated for exclusive use of the development resulting from the General Plan Amendment and is available for delivery to the Nipomo Mesa Water Conservation Area. In the future, it is expected that a portion of the demand will be met by the Supplemental Water and delivery of supplemental water, and possibly better utilization of recycled water. It should be noted that the County of San Luis Obispo has yet to formally adopt a supplemental water in-lieu fee; and absent the adoption, there is some uncertainty about the supplemental water in-lieu fee to be applied in accordance with County Ordinance §3090.

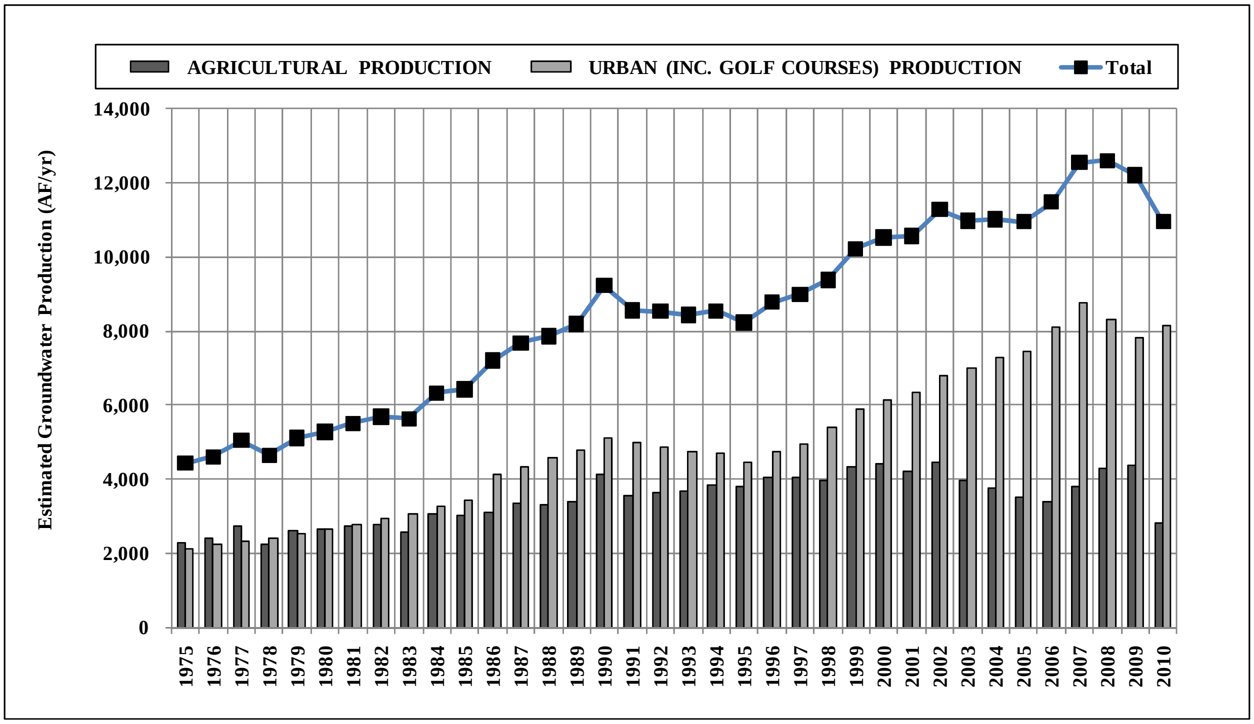

Figure 4-1. Historical NMMA Groundwater Production

5. Hydrologic Inventory

The hydrologic inventory accounts for the volumes of water that flow in to and out of the aquifers in the NMMA resulting in the change in storage. A conceptual schematic depicts the inflows and outflows to the aquifers underlying the NMMA (Figure 5-1). The hydrologic inventory can be formalized in the following equation:

$$\text{Change in Storage } (\Delta S) = \text{Inflow} - \text{Outflow}.$$

In the following sections the components of the 2011 hydrologic inventory are presented and discussed. The principal sources of inflow are rainfall, streamflow, wastewater, groundwater (i.e. subsurface flow across the boundaries of the NMMA) inflow, and return flow. The principal outflows are groundwater production and groundwater outflow. Supplemental Water is also discussed as a potential future supplemental source of inflow.

5.1. *Rainfall and Percolation Past Root Zone*

Rainfall measurements made during calendar year 2011 range from 26 to 34 inches for water year 2011, and are approximately 180 percent of the average long-term annual rainfall (see Section 3.1.3 Rainfall). Rainfall on the NMMA infiltrates the soil surface and is either stored in the soil profile until it is evaporated or transpired by overlying vegetation, or percolates downward into shallow or deep aquifers. Rainfall on hardscape surfaces flows to local depressions where infiltration occurs. Locally rainfall may generate runoff from the NMMA to places adjacent to the NMMA boundary; however, the amount of runoff out of the NMMA is negligible. The TG has estimated the portion of rainfall that percolates past the root zone is 12,296 AF in water year 2011.

5.2. *Subsurface Flow*

The groundwater subsurface flow is the volume of water that flows into and out of the NMMA groundwater system. Typical methods used to estimate subsurface flow is Darcy's equation (using hydraulic conductivity, groundwater gradient, and aquifer thickness) or flow equations that are part of a regional groundwater model. In the NMMA, the three areas with the most potential for subsurface flow are at the northwestern boundary with the Northern Cities Management Area, the southern boundary with the Santa Maria Valley Management Area, and the seaward edge of the basin. Contours of groundwater elevations in this report (Section 6.1.4 Groundwater Gradients) suggest that there is net inflow from the Santa Maria Valley Management Area, net outflow at the coast (required to prevent seawater intrusion), and subsurface flow into or out of the Northern Cities Management Area. The amount of inflow across the eastern boundary is not well understood.

The nature and extent of the confining layer(s) beneath the NMMA and the extent that faults in the NMMA may act as barriers to subsurface flow are not well understood. The TG has not yet quantified the subsurface flows; however, the TG is currently evaluating detailed hydrogeologic cross-sections along portions of the NMMA boundary necessary to make estimates of subsurface flow (See Section 9 Recommendations).

5.3. *Streamflow and Surface Runoff*

Streamflow and surface runoff are the volumes of water that flow into and out of the NMMA through surface water channels or as overland flow. Streamflow includes water within the Los Berros Creek, Nipomo Creek, and Black Lake Creek (Figure 5-2). Surface runoff occurs during major rainfall events and could occur in locations where local conditions near the NMMA boundary are sufficient to promote overland flow out of the area, and where shallow subsurface flow contributes to streamflow that is conveyed out of the NMMA, or to coastal dune lakes where it evaporates. This may occur in the following areas (Figure 5-2):

- Los Berros Creek streamflow into and out of the NMMA,
- Nipomo Creek streamflow into and out of NMMA,
- Black Lake Canyon streamflow out of the NMMA,
- Surface runoff from steep bluffs adjacent to Arroyo Grande Valley, and
- Surface runoff from steep bluffs adjacent to Santa Maria River Valley.

The volume of streamflow which enters and leaves the NMMA is not well understood. The TG continues to analyze where it might be appropriate to install temporary or permanent stream gauging sites to determine the volume of water that percolates beneath streams in the NMMA.

5.4. *Groundwater Production*

The groundwater production component of the Hydrologic Inventory is calculated using metered production records where available and estimated from land use data where measurements are unavailable. The calendar year 2011 groundwater production is approximately 10,538 AF (See Section 4.2.2 Current Demand).

5.5. *Supplemental Water*

Supplemental Water is the volume of water produced outside the NMMA and delivered to the NMMA. There was no supplemental water delivered to the NMMA in calendar year 2011. Future deliveries of supplemental water will be measured and subsequent Annual Reports will present the volume and disposition of the supplemental water delivered to the NMMA. An evaluation of the basin impacts from the potential future importation of the proposed NSWP water is presented in an appendix to this Annual Report (see Appendix F).

5.6. *Wastewater*

Wastewater discharges include the volumes of wastewater effluent discharged by the five wastewater treatment facilities located within the NMMA, and individual septic tanks where centralized sewer service is not provided. Wastewater discharges are estimated for the calendar year 2011. The WWTFs include the Southland Wastewater Works (Southland WWTF), the Blacklake Reclamation Facility (Blacklake WWTF), Rural Water Company's Cypress Ridge Wastewater Facility (Cypress Ridge WWTF), the Woodlands Mutual Water Company Wastewater Reclamation Facility (Woodlands WWTF), and La Serena (GSWC). The Southland WWTF discharges treated wastewater into infiltration basins (See Section 3.1.10 Wastewater Discharge and Reuse). A portion of the water percolates and returns to the groundwater system and the remaining portion evaporates. The estimated percolation from Southland WWTF is 629 AF. The treated effluent from Blacklake WWTF (61 AF), Cypress Ridge WWTF (44 AF), and Woodlands WWTF (40 AF) is used to irrigate golf course landscaping, reducing the demand for groundwater production. La Serena discharged 6 AF. The total WWTF effluent in the NMMA was 780 AF (Table 3-7). The wastewater discharged in septic systems percolates downward and may recharge the Shallow Aquifers, the Deep Aquifers, or become shallow subsurface flow outside the NMMA. The estimated amount of return flow from indoor use by rural residences is 180 AF.

5.7. *Return Flow of Applied Water and Consumptive Use*

Return flow is defined as the amount of recharge to the aquifers resulting from applied water that percolates past the root zone to recharge the aquifer(s). This functional definition differs somewhat from that used in the Stipulation to apportion the right to use water that was imported to the basin. However, the physical process of recharge by return flow of applied water is the same regardless of where the water originated.

The TG currently assumes that with the exception of NCSD, Woodlands, GSWC, ConocoPhillips, and RWC, all other groundwater produced for outdoor use is attributable to sustaining plant life and replenishing soil profile storage, and that only rainfall generates percolation. Rural residences produce groundwater for indoor use in addition to outdoor use. The estimated amount of return flow from indoor use by rural residences is 180 AF. The estimated amount of return from urban outdoor water use is 44 percent of the water supplied by NCSD, Woodlands, GSWC, and RWC. The total amount of return flow from outdoor water use is thus 44 percent of 5,123 AF (Table 3-3), or about 2,050 AF, because no return flow occurs from ConocoPhillips' groundwater production. The estimated total return flow, which includes 180 AF of recharge from septic systems (See Section 5.6), is 2,230 AF in calendar year 2011.

The estimated consumptive use of water in the NMMA, computed by subtracting the return flow from the groundwater production, is approximately 8,308 AF.

5.8. *Change in Groundwater Storage*

The change in groundwater storage from the hydrologic inventory reflects the difference between inflow and outflow for a period of time. Typically, this change in storage is compared to a change in storage computed from groundwater contours, cross-checking the results of each. Storage changes from groundwater contours are typically calculated by measuring change in groundwater elevation and multiplying that change by a storage factor. The TG's current understanding of confining conditions within the NMMA precludes calculating change in groundwater storage from groundwater contours at this time for the management area.

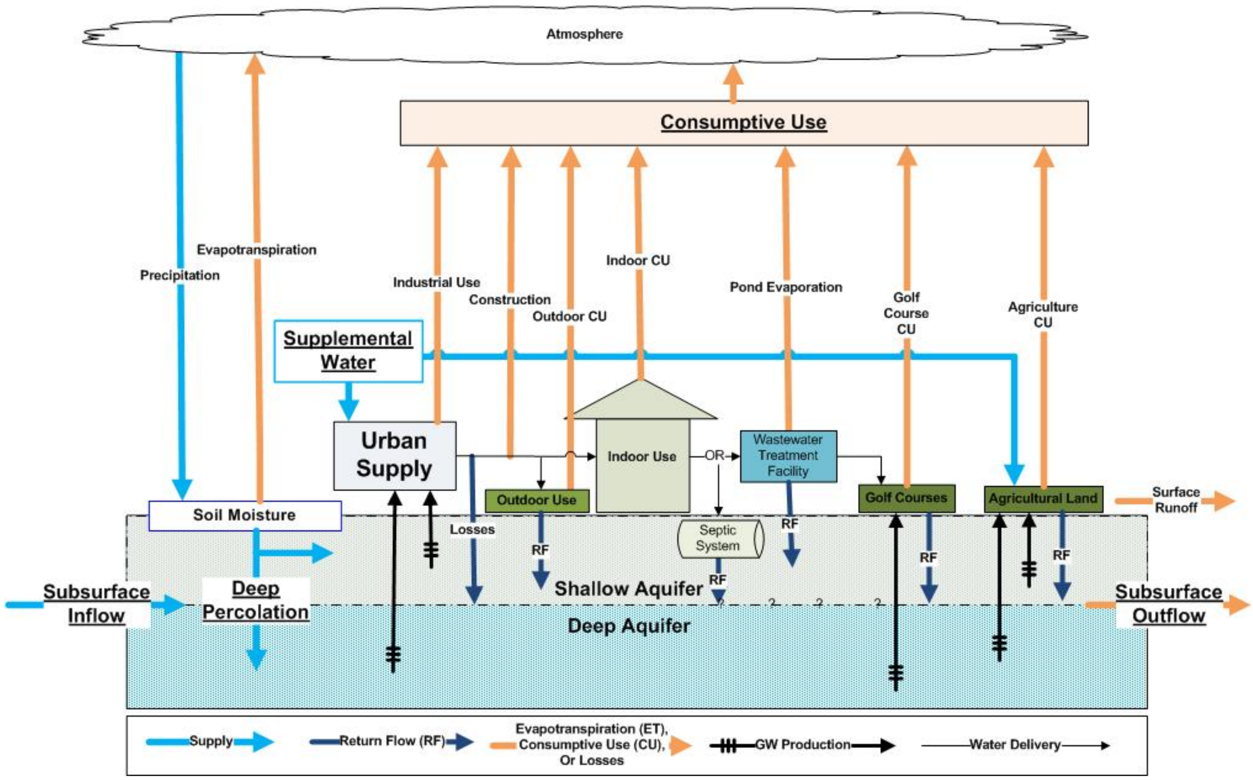

Figure 5-1. Schematic of the Hydrologic Inventory

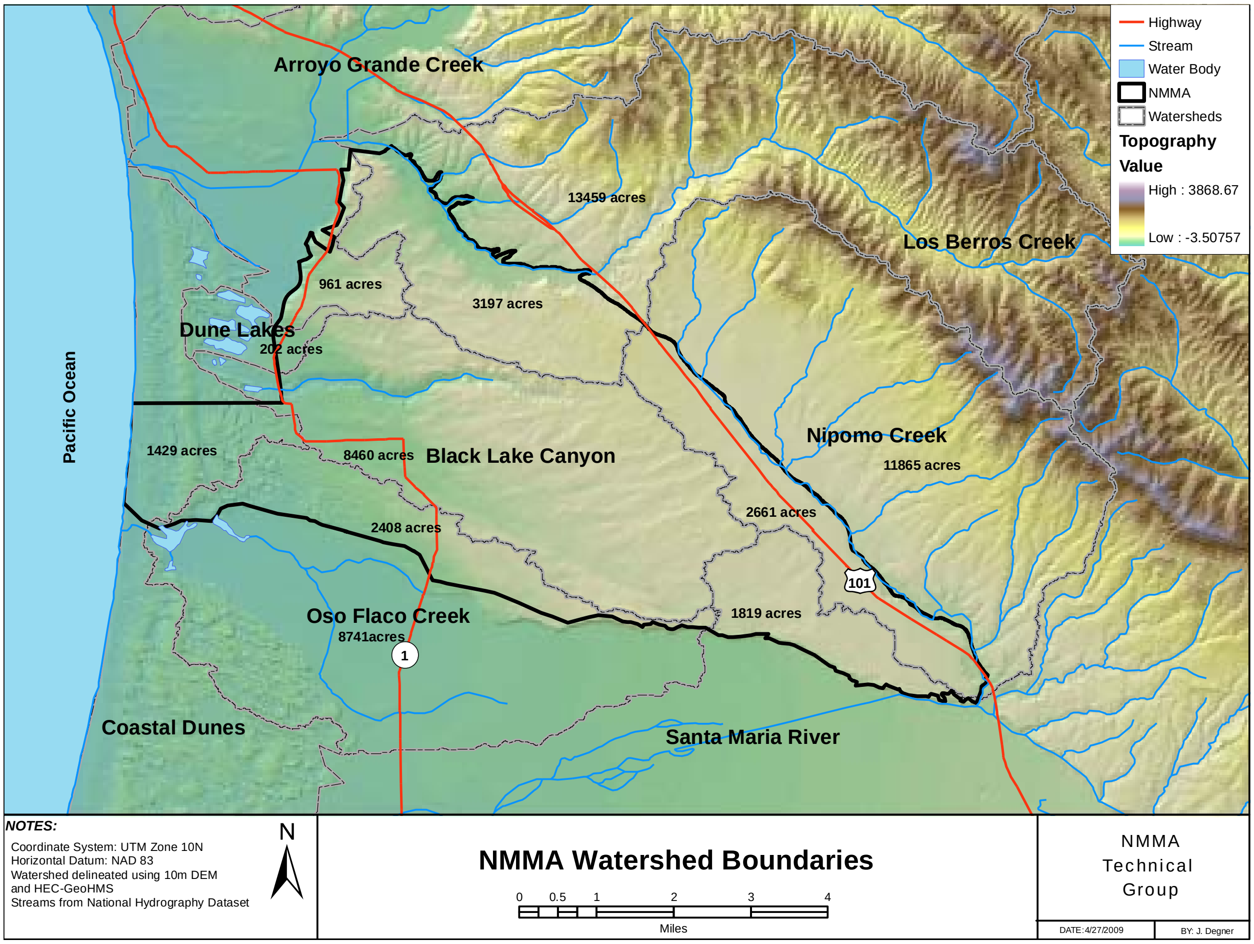

Figure 5-2. NMMA Watershed Boundaries

6. Groundwater Conditions

Groundwater conditions are principally characterized by measurements of groundwater elevations and groundwater quality, and interpretations such as groundwater elevation contours, groundwater gradients, and historical trends in elevations and water quality.

6.1. *Groundwater Elevations*

Groundwater elevations are analyzed using several methods. Hydrographs (graphs of groundwater elevation through time) for wells within and adjacent to the NMMA were updated through calendar year 2011. Hydrographs were constructed for a number of wells, particularly all the Key Wells. The Key Wells generally represent overall groundwater elevations of the principal production aquifers in the inland areas. In coastal monitoring wells, groundwater elevations were graphed for each well completion within a nested site to compare to sea level. Finally, the aggregate of groundwater elevation measurements was used to construct groundwater contour maps for the spring and fall of 2011.

6.1.1. Results from Inland Key Wells

Hydrographs were prepared for the Key Wells (Figure 6-1, Figure 6-2). Groundwater elevations in 2011 were above sea level in all Key Wells, though the trend in groundwater elevations varies. Groundwater elevations in the South-East and North-West portions of the NMMA have generally declined since about 2000, although there has been some flattening of the downward trend during the last three years. Groundwater elevations are generally within their historical range, although several of the Key Wells with long historical records are at or near their historical lows (e.g., well 11/35-13C1 [Figure 6-1]) and wells 12/35-33L1 and 11/35-5L1 [Figure 6-2]).

6.1.2. Results from Coastal Monitoring Wells

The elevation of groundwater in the coastal monitoring wells is very important because it is required to determine whether there is an onshore or offshore gradient to the ocean. In both coastal monitoring sites adjacent to the NMMA, groundwater elevations are above the criteria that defines the Potentially Severe Water Shortage Conditions (Figure 6-3, Figure 6-4). In spring 2011, the deeper well at site 12C had heads that were above ground surface.

6.1.3. Groundwater Contours and Pumping Depressions

Groundwater elevation data for the Deep Aquifers were plotted on two separate maps for Spring and Fall of 2011 and contour by hand. Groundwater elevation contours were constructed for both Spring and Fall of 2011 so that high and low groundwater conditions could be analyzed (Figure 6-5, Figure 6-6).

Spring 2011 contours represent a broadening of the pumping depression compared to 2010, as expressed by the 10 foot to 30 foot contours, and additionally show recharge to the aquifers coincident with the Los Berros Creek and Arroyo Grande Creek deposits along the north boundary of the NMMA. Fall 2011 contours represent a flattening of the groundwater elevations across the central NMMA expressed by the 10 foot contour and a broadening of the pumping depression compared to 2010, as expressed by the 0 foot contour. Notably, the pulse of recharge evident in the Spring 2011 contours has apparently migrated west to the coast as reflected in the 10 foot contour west of the dune lakes.

The most obvious feature in the contour maps is the pumping depression that has existed for decades within the north-central portion of the NMMA. Spring 2011 contours represent a broadening of the pumping depression from 2010 expressed by the 10 foot to 30 foot contours. Fall 2011 contours represent a flattening of the groundwater elevations across the central NMMA expressed by the 10 foot contour and a broadening of the main pumping depression expressed in the 0 foot contour.

The pumping depression trends in a northwest-southeast direction, parallel to the Santa Maria River and Oceano faults. DWR (2002) suggested that the Santa Maria River fault affected flow in the Deep Aquifers, with groundwater elevation contours offset by several tens of feet. However, the more-extensive groundwater elevation data set used in this Annual Report could not support this conclusion – the data are too variable from well to well in the eastern portion of the NMMA to detect offset of groundwater contours in the range of tens of feet.

Of interest is the area along the northwesterly boundary of the NMMA, adjacent to the Northern Cities Management Area. There continues to be a low-relief "saddle" between the NMMA and the Northern Cities Management Area to the north where groundwater elevations are a few feet higher near the boundary between the Management Areas. This saddle was reinforced in Spring 2011 as recharge to the aquifers occurred coincident with the Los Berros Creek and Arroyo Grande Creek deposits along the north boundary of the NMMA (Figure 6-5). It should also be noted that this report does not extend groundwater elevation contours to the east and southeast along Los Berros Creek because of the presence of a bedrock outcrop and the uncertainty in the hydrologic connection between shallow alluvial sediments along Los Berros Creek and the Deep Aquifers in the main portion of the basin.

Near the coastline, groundwater elevations within the NMMA are above sea level. As in earlier years, there is a ridge of higher groundwater elevations in the aquifers (groundwater elevations 10 feet to 20 feet above sea level) between coastal areas of the NMMA and the pumping depression in the north-central portion of the NMMA. Relief across this ridge of higher groundwater elevations was no more than 5 feet to 10 feet in Fall 2011. The highest elevation along the ridge is coincident with the Black Lake Canyon and west from where the Oceano fault crosses Black Lake Canyon. The persistence of this hydrologic feature is of interest to the TG, and further investigations regarding a local recharge zone are being considered.

The groundwater contours along the eastern portion of the NMMA are sub-parallel to the eastern NMMA boundary indicating flow southwest into the NMMA, suggesting that recharge may occur in this area. Besides the possibility of recharge from rainfall and seepage from adjacent older sediments along and to the east of the edge of the NMMA, Los Berros Creek flows across the shallow alluvium, which suggests local recharge may occur.

6.1.4. Groundwater Gradients

Groundwater gradients can be calculated directly from the groundwater elevation contour maps (Figure 6-5, Figure 6-6). The discussion of gradients is separated into coastal gradients that could affect potential seawater intrusion and gradients to/from adjacent management areas.

Coastal Gradients

In the coastal portions of the NMMA, there was an offshore gradient in both spring and fall of 2011 in the NMMA. This offshore gradient extends two to three miles inland, where it reverses to a landward gradient. The groundwater ridge between these opposing gradients is a transient feature formed because of the inland pumping depression, and may be in part supported by local recharge from Black Lake Canyon Creek and recharge through the Los Berros Creek and Arroyo Grande Creek deposits. Continued pumping at current rates in the depression could result in the elimination of the groundwater ridge, replaced by a landward gradient from the coastal monitoring wells all the way to the inland groundwater depression. If this were to occur, the current protection from possible seawater intrusion provided by the seaward groundwater gradient would be lost.

Gradients to/from Adjacent Management Areas

As discussed earlier in this section, the groundwater elevation contours between the NMMA and the Northern Cities Management Area consists of a saddle or divide in the groundwater elevations that separate the two management areas. The groundwater elevations near the divide are in the range of several feet higher than adjacent areas.

The northwest groundwater gradient along the southern boundary of the NMMA creates flow into the NMMA (Figure 6-5, Figure 6-6). This northwest gradient is limited to the area between the river and the NMMA boundary – it does not extend into the Santa Maria Valley on the south side of the river. Thus, the groundwater elevation beneath the river forms an effective boundary where groundwater flows toward the NMMA north of the river and into the main Santa Maria basin south of the river. This pattern of gradients suggests that the Santa Maria River is a source of supply to both management areas. If the

Deep Aquifers are confined in the area between the river and the NMMA boundary, then recharge from the river to the aquifers must be largely occurring up-gradient in places where no confining conditions exist.

6.2. ***Groundwater Quality***

Water quality is a concern for all groundwater producers, although the specific concerns vary by water use. Water quality is somewhat different in different portions of the NMMA because:

- the source of recharge varies for different portions of the aquifer system,
- groundwater can develop different mineral signatures from the rock it flows through, and
- percolation of surface water mobilizes constituents of concern and carries these into the aquifers.

Water quality conditions in the NMMA during calendar year 2011 were relatively unchanged from 2010. The following sections describe coastal water quality and inland water quality conditions.

6.2.1. Results of Coastal Water Quality Monitoring

Quarterly coastal water quality monitoring within the NMMA boundary is currently limited to a single group of monitoring intervals at well 11N/36W-12C1, 2, 3, but the TG is also aware of published data for coastal water quality conditions in the NCMA. Limited historical water quality data are also available for other coastal monitoring wells to either side of the NMMA. Most chloride concentrations in the coastal wells are less than 100 mg/L, and do not show evidence of significant change over time (Figure 6-7). Coastal water quality monitoring at 11N/36W-12C1, 2 & 3 in 2011 also shows consistent results with respect to other common water quality characteristics such as TDS and electrical conductivity (specific conductance; Figure 6-8). Values for these constituents confirm relatively high dissolved ion content in groundwater, but at historically consistent values that are mostly within limits for existing uses.

6.2.2. Results of Inland Water Quality Monitoring

Water quality from inland wells is variable, both between wells (with similar groundwater elevations) and over time within a single well. Neither chloride nor total dissolved solids concentrations have experienced large temporal changes in samples from inland wells. In 2011, localized nitrate concentration measurements have been a cause for concern.

Nitrate: Elevated nitrate concentrations in groundwater generally result from anthropogenic causes. Nitrate is principally a potable water concern (as compared to a concern for irrigation water), with a primary drinking water standard of 45 mg/L (nitrate as NO_3, which is used throughout this report).

In calendar year 2011, nitrate concentration measurements within the principal aquifers were below the drinking water standard, except for one well in the northern area of the NMMA that exceeded the drinking water standard. A number of wells throughout the NMMA exhibit nitrate concentrations over half the drinking water standard.

Chloride: A primary concern for both drinking water and irrigation use is high chloride concentrations. Depending upon the crop, chloride concentrations well below the drinking water standard of 500 mg/L can cause leaf burn, plant stunting, and plant death. Elevated chloride concentrations can occur in groundwater from the recharge by return flows of water applied to overlying land uses, tidal waters, and shallow lakes, especially in unconfined aquifers.

In calendar year 2011, chloride concentrations were largely unchanged from the previous year, with 95 mg/l chloride or less for all groundwater samples obtained from the Deep Aquifers in the NMMA. Shallow wells near industrial and wastewater facilities have the highest chloride concentrations, but the concentrations are below the water quality standards.

Total Dissolved Solids (TDS): In calendar year 2011, TDS concentrations were similar to 2010 results. Based on limited sampling in calendar year 2011, all Deep Aquifer production and monitoring wells contained TDS at or below 1,100 mg/l, with most wells below 900 mg/l. Groundwater samples from several shallow wells contained total dissolved solids at or above the 1,000 mg/l California recommended secondary standard for TDS. The NMMA TG will continue to monitor the water quality of these wells.

Hydrocarbons. Several local sites of known or potential soil and shallow groundwater contamination are described by environment assessments or ongoing remediation and monitoring activity at sites within the NMMA. These sites are associated with an oil pipeline along Nipomo Creek and a gas station in the eastern portion of the NMMA. The sites are in various stages of assessment or corrective action and are regulated by the RWQCB or other state agencies. Four sites are currently undergoing study or remedial action in the NMMA (see Table 6-1 below).

Table 6-1. State Water Resources Control Board GeoTracker Active Sites

Site Name	Address	Status	Notes
Chevron Station 9-5867	460 West Tefft St	Open; Site Assessment	Leaking underground tank site. In 1998, a release of gasoline was discovered impacting soil.
Nipomo Creek Pipeline, Line 300	671 Oakglen Ave	Open; Remediation	Petroleum hydrocarbon impacted soil and shallow groundwater adjacent to petroleum pipeline at two sites approximately ½ mile apart. Corrective Action Plan was approved in 2010. Removal of impacted soil continued during 2011.
ConocoPhillips, Line 300	Tefft St at Carillo St intersection	Open; Site Assessment	Petroleum hydrocarbon impacts to soil and shallow groundwater adjacent to two petroleum pipelines (ConocoPhillips & Unocal). Site assessment and work plan development ongoing in 2011.
ConocoPhillips Refinery, Santa Maria Facility	2555 Willow Rd	Open; Site Assessment	Case opened in 1999 to investigate potential soil and shallow groundwater impacts from a coke pile area. Groundwater monitoring ongoing in 2011.
Source: http://geotracker.swrcb.ca.gov			

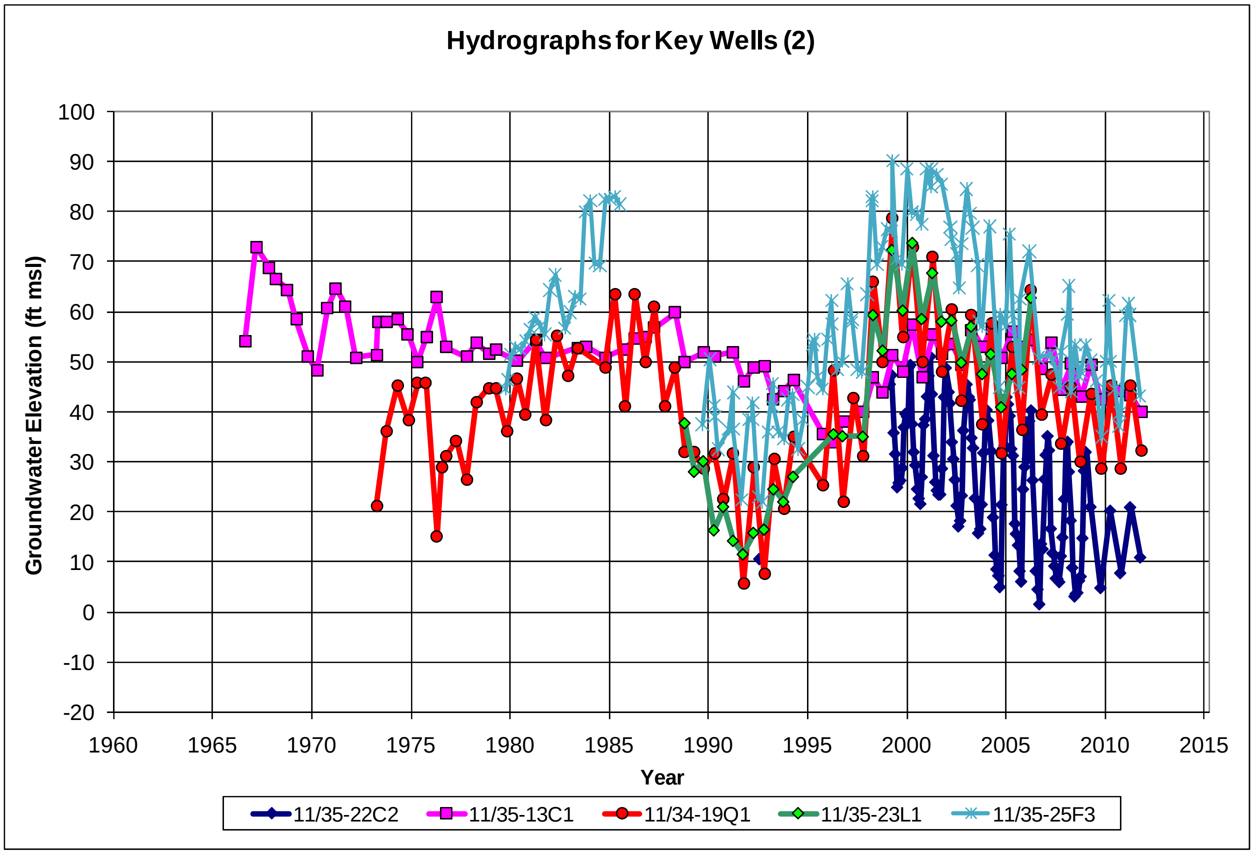

Figure 6-1. Key Wells Hydrographs, South-East Portion of NMMA. Note: Lines between data values are included to track the sequence of points and do not represent measurements**.**

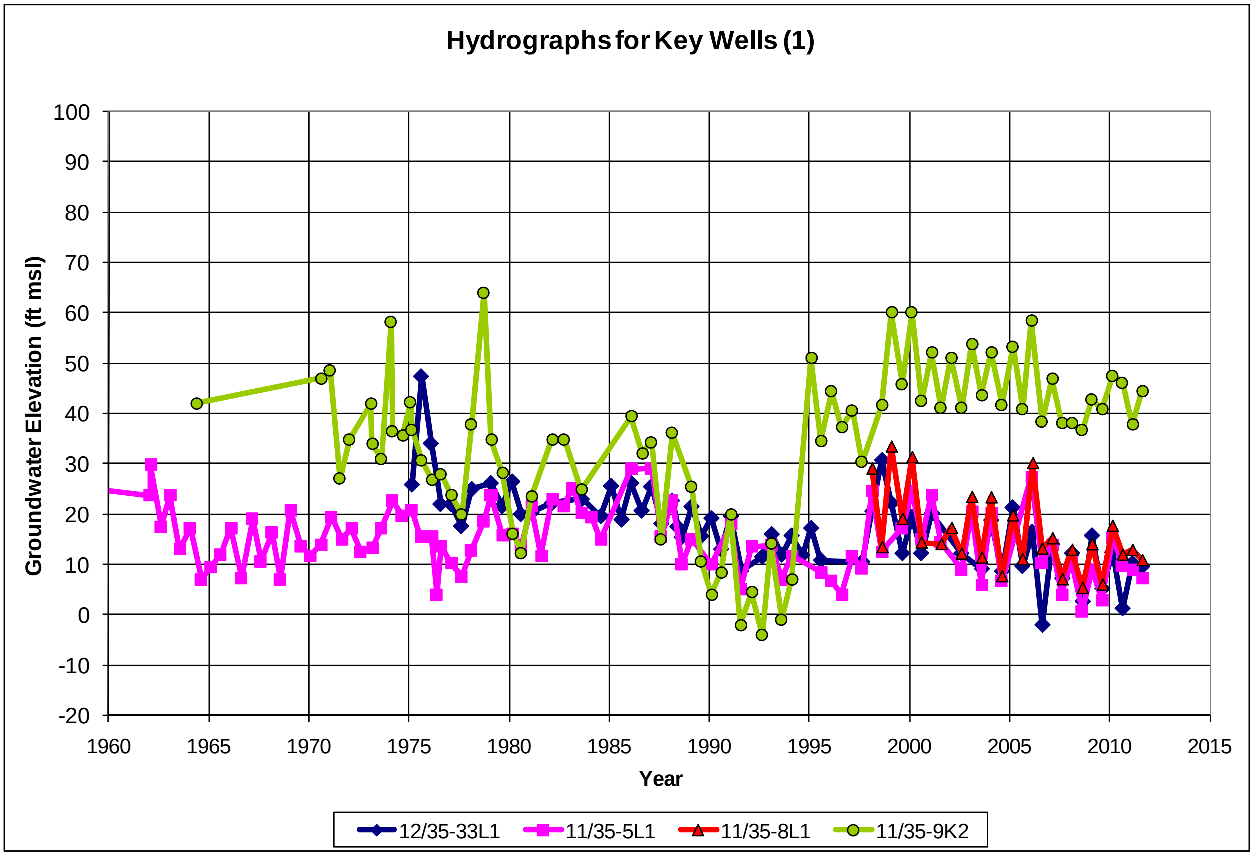

Figure 6-2. Key Wells Hydrographs, North-West Portion of NMMA

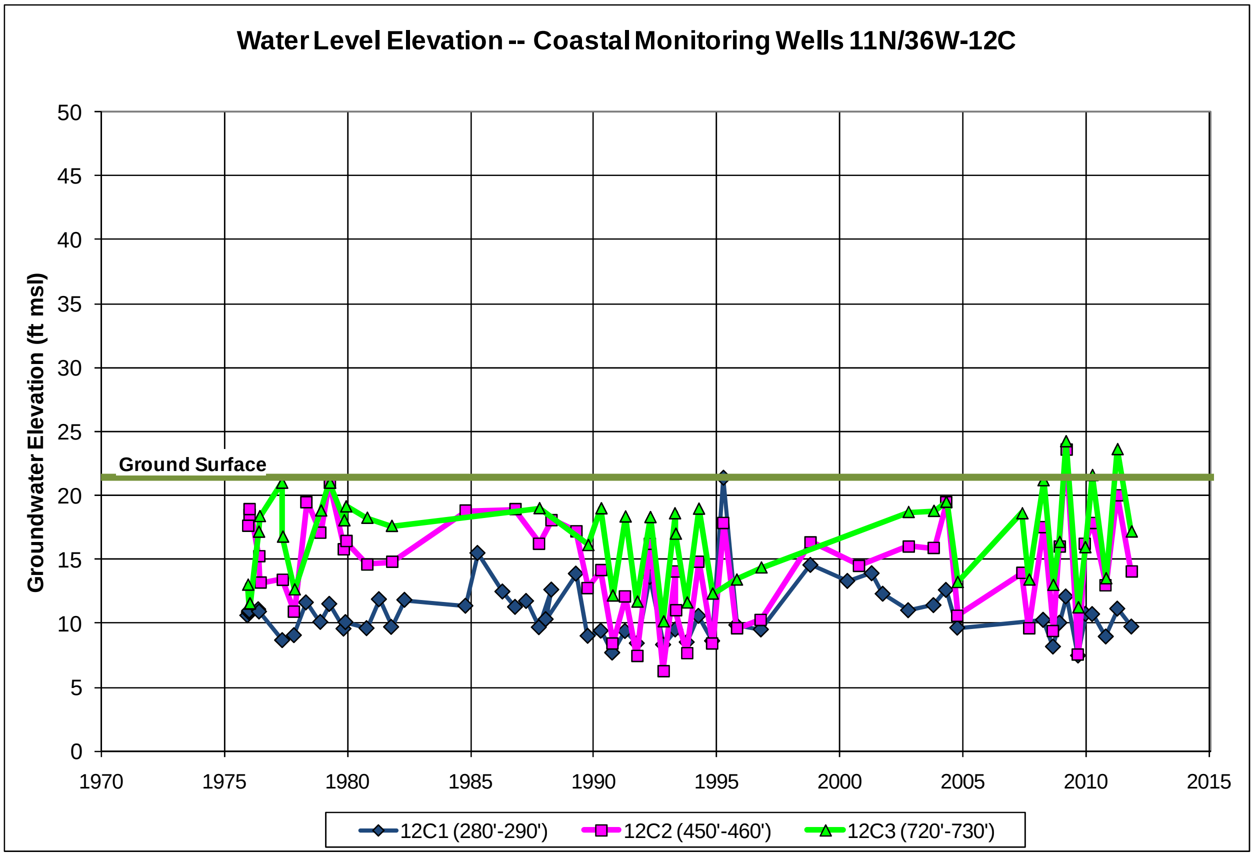

Figure 6-3. Hydrograph for Coastal Monitoring Well Clusters 11N/36W-12C. Note: Water levels measured under artesian flow prior to 2008 were observed without measuring the hydraulic head and recorded as a default value of 2 feet above the casing.

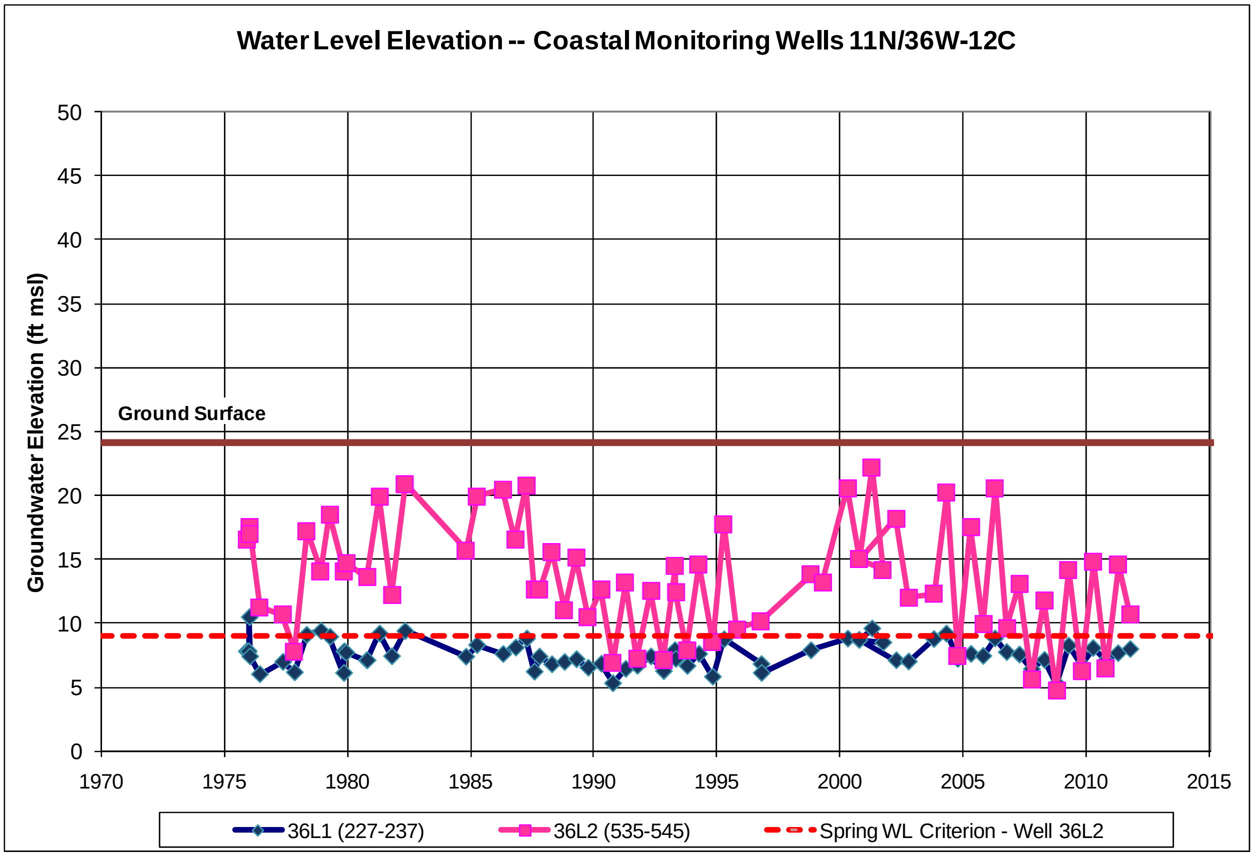

Figure 6-4. Hydrograph for Coastal Monitoring Well Clusters 12N/36W-36L

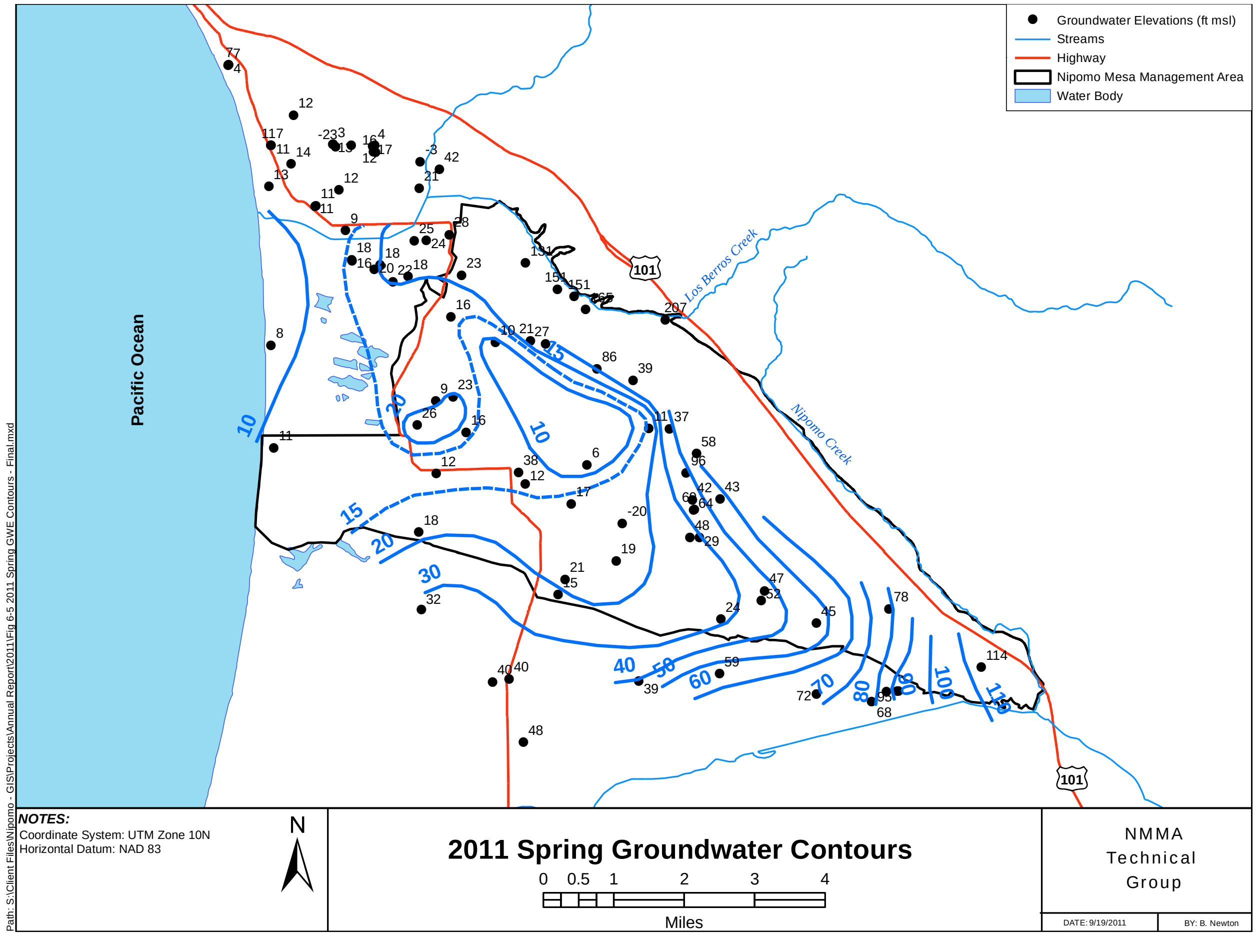

Figure 6-5. 2011 Spring Groundwater Contours

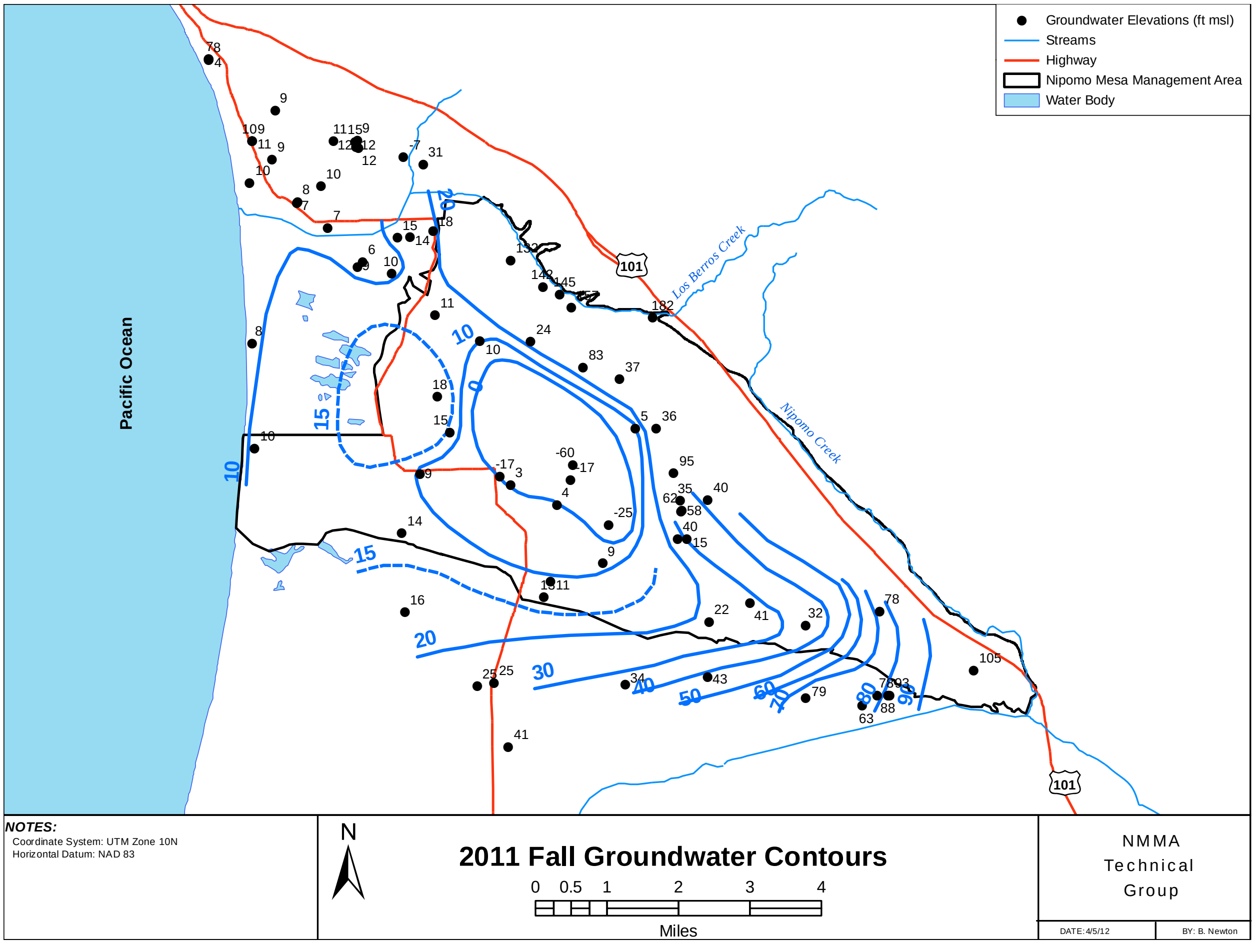

Figure 6-6. 2011 Fall Groundwater Contours

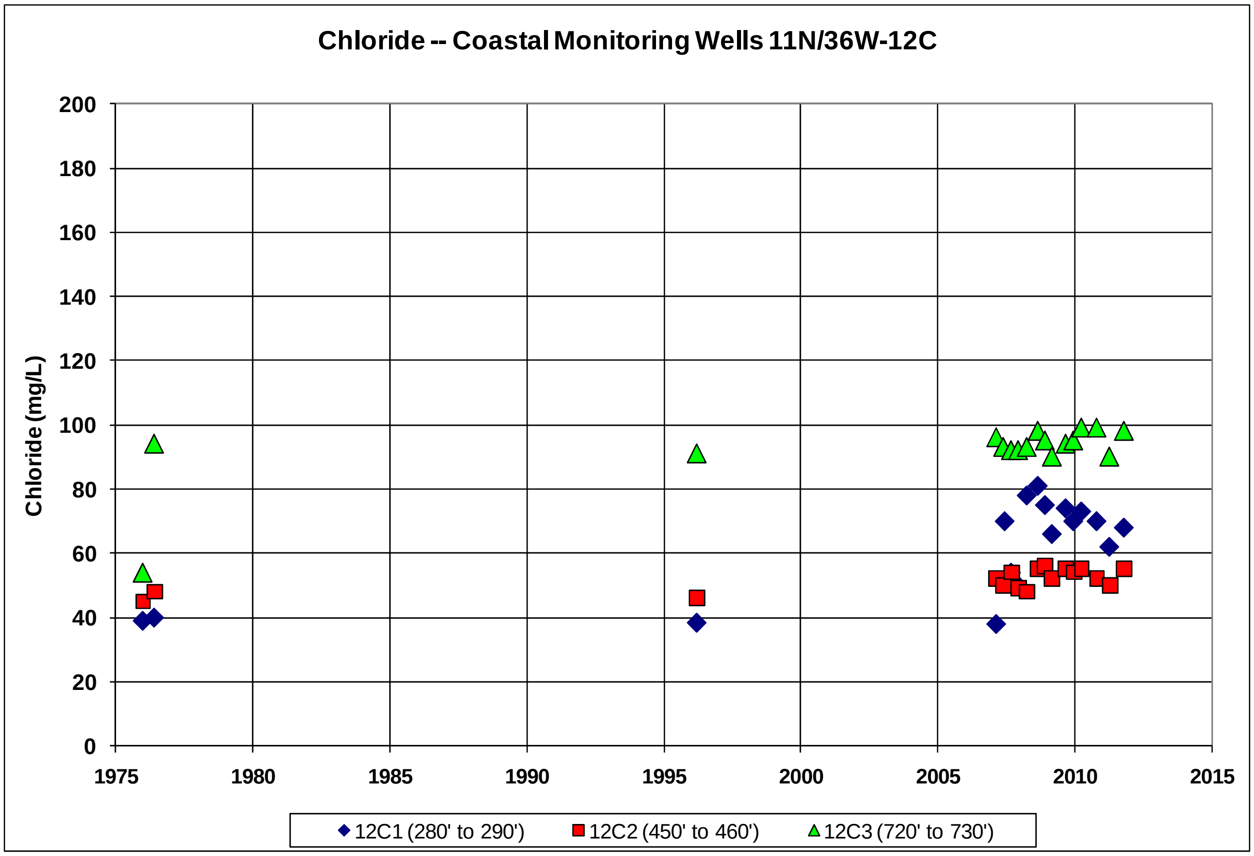

Figure 6-7. Chloride in Coastal Well 11N/36W-12C

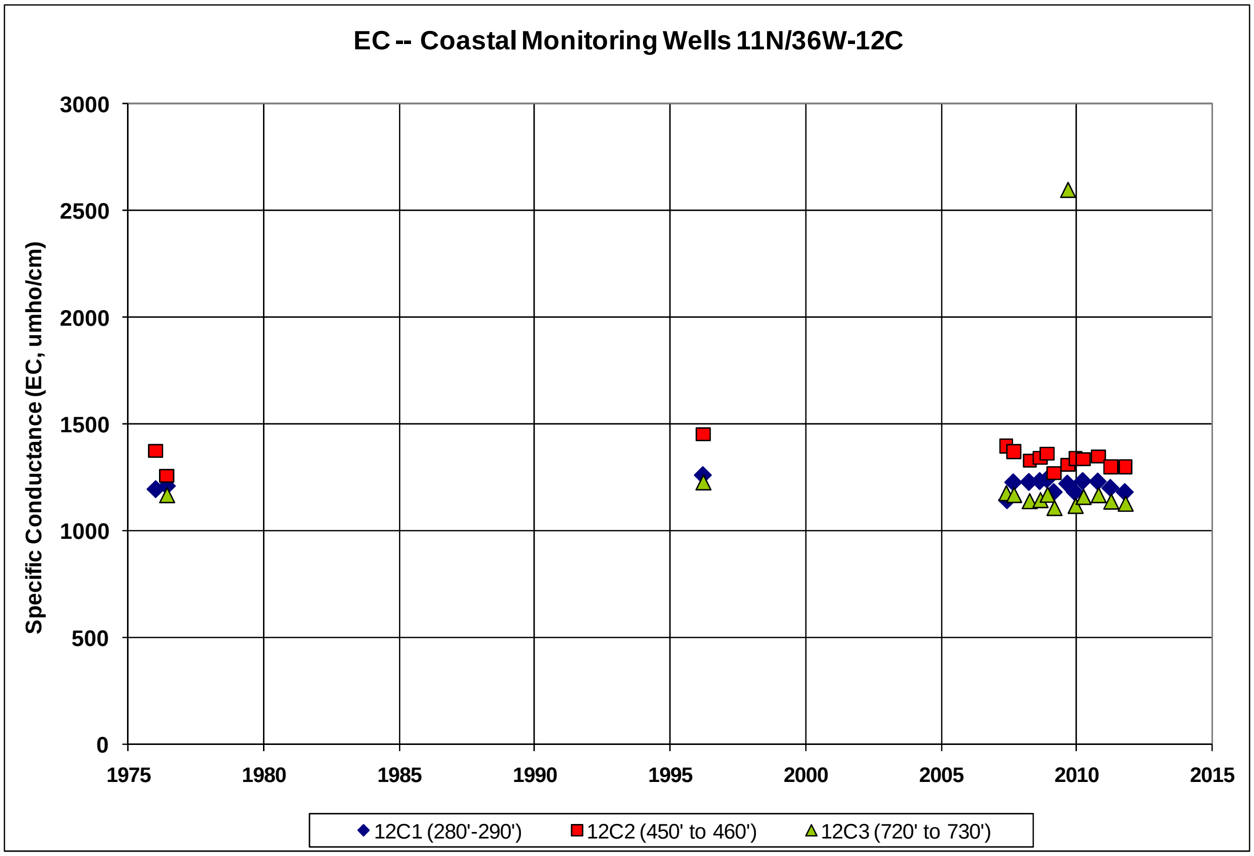

Figure 6-8. Electrical Conductivity in Coastal Well 11N/36W-12C

7. Analyses of Water Conditions

Current groundwater conditions, water shortage conditions, and long-term trends are presented in the following sections, with emphasis on the primary areas of concern.

7.1. *Current Conditions*

7.1.1. Groundwater Conditions

The primary areas of focus in evaluating the conditions of groundwater within the NMMA are: 1) groundwater elevations and water chemistry of coastal monitoring wells, 2) the coastal groundwater gradient, 3) the overall groundwater elevations within the NMMA, as measured by the Key Wells Index, and 4) the extent of the pumping depression.

Coastal Monitoring Wells – Both groundwater elevations and chloride concentrations in the coastal well cluster within the NMMA have been stable for some years. However, groundwater elevations in the coastal well cluster 36L have declined the last decade (Figure 6-4).

Coastal Groundwater Gradient – There is currently a westward component of flow toward the ocean beneath the coastal dunes, separated from the inland groundwater depression by a transient groundwater divide (See Section 6.1.4 Groundwater Gradients). If the inland groundwater depression continues to expand, a landward gradient from the coastal monitoring wells to the inland groundwater depression may develop. In Spring and Fall 2011, the coastal gradient near Black Lake was towards the offshore with a slight northward component of flow that is more pronounced in the fall.

Key Wells Index – The Key Wells Index indicates trends in groundwater elevations within inland areas of the NMMA, and is intended to reflect whether there is a general balance between inflows and outflows in the NMMA. The 2011 Key Well Index declined sharply from 2010, even though rainfall was 180 percent of long-term average conditions and percolation past the root zone was 12,296 AF, roughly two times the typical amount. Groundwater elevations in several of the wells that make up the Key Wells Index have generally declined since about 2000, whereas groundwater elevations in some of these wells have increased over the past two to three years (see Section 6.1.1 Results from Inland Key Wells). The 2011 Key Wells Index value remains below the threshold criterion for Potentially Severe conditions (Figure 7-2).

Pumping Depression – The groundwater depression within the inland portion of the NMMA was evident in both Spring and Fall 2011 groundwater elevation contours (Figure 6-5, Figure 6-6). This depression creates a transient groundwater divide between both coastal areas and the Northern Cities Management Area. If this groundwater depression widens to the west or lengthens to the north, the groundwater divide may be breached, allowing groundwater flow from coastal areas to the groundwater depression. This potential reversal of groundwater gradients could create conditions for seawater intrusion. Thus, the TG will carefully research it for future reports in cooperation with the Northern Cities Management Area TG.

The other effect of the groundwater depression could be compaction and dewatering of fine-grained sediments within and adjacent to the aquifers of the NMMA, with subsequent land subsidence. There is currently no evidence of land subsidence within the NMMA, although small amounts of subsidence might go undetected. During dewatering and compaction, it is typically the finer grained sediments that are most impacted rather than the main water-producing horizons.

7.1.2. Hydrologic Inventory

The hydrologic inventory is currently incomplete due to the TG developing an improved understanding of subsurface flow across the NMMA boundaries. Although the hydrologic inventory cannot be used directly to calculate the potential imbalance between inflow and outflow for calendar year 2011, there are a number of observed conditions that indicate that outflow exceeds the ability of the inflow to replace this water pumped from the aquifers. These indicators include: 1) continued presence of the pumping depression in the NMMA, a portion of which is below sea level; 2) a limited component of seaward flow at the coast; 3) a flattening of the groundwater ridge between coastal and inland wells that protects inland areas from potential seawater intrusion; and 4) a threat on the north by the occurrence of seawater intrusion in the Deep Aquifers.

7.2. *Water Shortage Conditions*

The Stipulation requires the determination of the water shortage condition as part of the Annual Report. Water shortage conditions are characterized by criteria designed to reflect that groundwater levels beneath the NMMA as a whole are at a point at which a response would be triggered to avoid further declines in groundwater levels (Potentially Severe), and to declare that the lowest historic groundwater levels beneath the NMMA as a whole have been reached or that conditions constituting seawater intrusion have been reached (Severe). Potentially Severe Water Shortage Conditions exist in calendar year 2011.

Potentially Severe Water Shortage Conditions

The Stipulation, page 25, defines Potentially Severe Water Conditions as follows:

Caution trigger point (Potentially Severe Water Shortage Conditions)

(a) Characteristics. The NMMA Technical Group shall develop criteria for declaring the existence of Potentially Severe Water Shortage Conditions. These criteria shall be approved by the Court and entered as a modification to this Stipulation or the judgment to be entered based upon this Stipulation. Such criteria shall be designed to reflect that water levels beneath the NMMA as a whole are at a point at which voluntary conservation measures, augmentation of supply, or other steps may be desirable or necessary to avoid further declines in water levels.

Severe Water Shortage Conditions

The Stipulation, page 25, defines Severe Water Conditions as follows:

Mandatory action trigger point (Severe Water Shortage Conditions)

(a) Characteristics. The NMMA Technical Group shall develop the criteria for declaring that the lowest historic water levels beneath the NMMA as a whole have been reached or that conditions constituting seawater intrusion have been reached. These criteria shall be approved by the Court and entered as a modification to this Stipulation or the judgment to be entered based upon this Stipulation.

7.2.1. Coastal Criteria

All coastal groundwater elevation and water quality criteria for Water Shortage Conditions are at acceptable levels (Table 7-1).

Table 7-1. Criteria for Potentially Severe Water Shortage Conditions

Well	Perforations Elevations (ft msl)	Aquifer	Spring 2011 Elevations (ft msl)	Elevation Criteria (ft msl)	2011 Highest Chloride (mg/L)	Chloride Concentration Criteria (mg/L)
11N/36W-12C1	-261 to -271	Paso Robles	11.1	**5.0**	68	**250**
11N/36W-12C2	-431 to -441	Pismo	20.2	**5.5**	55	**250**
11N/36W-12C3	-701 to -711	Pismo	23.6	**9.0**	98	**250**
12N/36W-36L1	-200 to -210	Paso Robles	7.8	**3.5**	-	**250**
12N/36W-36L2	-508 to -518	Pismo	14.7	**9.0**	-	**250**

7.2.2. Inland Criteria

The inland criteria for Water Shortage Conditions use the Key Wells Index as a basis. The Spring 2011 Key Wells Index was 25.3 ft msl, at a lower elevation than the criterion for Potentially Severe Water Shortage Conditions of 31.5 ft msl, and sharply declined from the Key Wells Index for 2010 (Figure 7-2).

7.2.3. Status of Water Shortage Conditions

The Key Wells Index went below the elevation criterion for Potentially Severe Water Shortage Conditions with the Spring 2008 water level measurements, and has remained so through to Spring 2011. Exiting the Potentially Severe Water Shortage Conditions requires two consecutive years where the Key Wells Index is above the level of Potentially Severe Water Shortage Condition.

The responses required by the Stipulation are set forth as follows:

VI(D)(1b) Responses [Potentially Severe]. *If the NMMA Technical Group determines that Potentially Severe Water Shortage Conditions have been reached, the Stipulating Parties shall coordinate their efforts to implement voluntary conservation measures, adopt programs to increase the supply of Nipomo Supplemental Water if available, use within the NMMA other sources of Developed Water or New Developed Water, or implement other measures to reduce Groundwater use.*

VI(A)(5). …In the event that Potentially Severe Water Shortage Conditions or Severe Water Shortage Conditions are triggered as referenced in Paragraph VI(D) before Nipomo Supplemental Water is used in the NMMA, NCSD, [GSWC], Woodlands and RWC agree to develop a well management plan that is acceptable to the NMMA Technical Group, and which may include such steps as imposing conservation measures, seeking sources of supplemental water to serve new customers, and declaring or obtaining approval to declare a moratorium on the granting of further intent to serve or will serve letters.

Nipomo Mesa groundwater management options to address water shortage conditions include responses required under the Stipulation as well as other possible groundwater management actions to address a range of resource concerns associated with the current Potentially Severe Water Shortage Condition. TG concerns directly relating to groundwater conditions include:

- Depressed groundwater elevations, both as measured by the Key Wells Index and in specific portions of the management area;
- Very limited offshore gradient for a large area of the coastal and central portions of the NMMA;
- Very limited gradient separating the management area with the coastal area of seawater intrusion to the north.

Potential actions to address the above concerns include a range of projects and activities already in place, in progress, or contemplated for future consideration. Many of these possibilities have been reviewed previously in water supply evaluations (SAIC, 2006; Kennedy-Jenks, 2001; Bookman-Edmonston, 1994).

<u>Existing Actions in the NMMA reviewed by the TG include</u>

- Adoption in calendar year 2010 of a purveyor Well Management Plan, which includes conservation, public outreach, and facilities upgrades to allow greater distribution of pumping stresses away from areas of concern (see Section 1.1.6 Well Management Plan)
- Continued progress in 2011 on a NSWP (see Section 1.1.7 Supplemental Water)

<u>Potential actions to be reviewed by the TG include</u>

- Increased development of reclaimed water for certain NMMA water supply needs in lieu of pumping from the Deep Aquifers.

Different management options have different potential capacity to reduce demand or increase supply, and each has its own technical considerations. By way of example and assuming regulatory agency approval and the establishment of an appropriate cost benefit that meets the requirements of Prop 218 or the PUC, wastewater effluent that is not already reclaimed may be discharged in locations where wastewater effluent would have a beneficial effect on the deep aquifers and in areas closer to the coast.

Areas of special concern with regard to potential shortage conditions have special significance if they experience beneficial results from projects to manage groundwater demands and overall supply. For example, the coastal portion of the NMMA has a limited component of seaward flow, and is threatened on the north by the occurrence of seawater intrusion in the Deep Aquifers. Actions that maintain a healthy ocean-ward component of flow protect the basin from potential seawater intrusion. Similarly, the pumping depression in the central portion of the NMMA has transient groundwater levels below sea level and is a pronounced feature of the main producing aquifers in the NMMA (see Figures 6-5 and 6-6). Allowing water levels to rebound in this area would also help to maintain protective groundwater gradients.

7.3. ***Long-term Trends***

Long-term trends in climate, land use, and water use are presented in the following sections.

7.3.1. Climatological Trends

Climatological trends have been identified through the use of cumulative departure from mean analyses. A cumulative departure from the mean represents the accumulation, since the beginning of the period of record, of the differences (departures) in annual total rainfall volume from the mean value for the period of record. Each year's departure is added to or subtracted from the previous year' cumulative total, depending on whether that year's departure was above or below the mean annual rainfall depth. When the slope of the cumulative departure from the mean is negative (i.e. downward), the sequence of years is drier than the mean, and conversely when the slope of the cumulative departure from the mean is positive (i.e. upward), the sequence of years is wetter than the mean. The cumulative departures from the mean were computed for the rainfall station Mehlschau (38), the longest rainfall record for the NMMA (Figure 7-3).

Historical rainfall records for the Nipomo Mesa begin in 1920. There are three significant long-term dry periods in the record, from 1921 to 1934, from 1944 to 1951, and from 1984 to 1991. Long-term dry periods have occurred in the last 90 years that are longer in duration than the 1987 to 1992 drought (Figure 7-3). Between each large dry period, three wetting periods have occurred. These wetting periods are from 1935 to 1943, from 1977 to 1983, and from 1994 to 2001.

The period of analyses (1975-2011) used by the TG is roughly 11 percent "wetter" on average than the long-term record (1920-2011) indicating a slight bias toward overestimating the amount of local water supply resulting from percolation of rainfall. The Water Years 2007, 2008, and 2009 have had less than average rainfall. Water Year 2007 was approximately 45 percent to 50 percent of average rain fall, Water Year 2008 was approximately 94 percent to 97 percent of average rain fall, and Water Year 2009 was approximately 67 percent to 73 percent of average rain fall. For the past two years, (WY 2010 and WY2011), rainfall was approximately 130 percent and 180 percent of average conditions (Table 3-1).

7.3.2. Land Use Trends

The DWR periodically has performed land use surveys of the South Central Coast, which includes the NMMA, in 1958, 1969, 1977, 1985, and 1996. A land use survey for only the NMMA was performed in 2007 based on 2007 aerial photography (See Section 3.1.8 Land Use). Based on these surveys, land use in the NMMA has changed dramatically over the past half-century (Table 7-2, Figure 7-4, and Figure 7-5). Urban development has replaced native vegetation at an increasing rate, especially over the past 10 years. Agriculture land use has remained relatively constant (see Section 3.1.8 Land Use).

Table 7-2. NMMA Land Use – 1959 to 2007 (acres)

	1959	1968	1977	1985	1996	2007
Agricultural	1,600	2,000	2,000	2,200	2,000	2,600
Urban	300	700	2,200	3,300	5,800	10,200
Native	19,200	18,400	16,900	15,600	13,300	8,300
Total	21,100	21,100	21,100	21,100	21,100	21,100

7.3.3. Water Use and Trends in Basin Inflow and Outflow

DWR (2002) estimated the Dependable Yield (DWR, 2002. Page ES21) for their study area to be between 4,800 and 6,000 AF/yr. Their study area is approximately equivalent to the NMMA.

The estimated groundwater production is 10,538 AF for calendar year 2011, which is about two and one half times the groundwater production in 1975 (Figure 4-1), confirming a trend of increased groundwater production over the last 35 years or so. The estimated consumptive use of water for urban, agricultural and golf course, and industrial use for calendar year 2011 is 8,308 AF. Contours of groundwater elevations in this report suggest that there is likely inflow from the Santa Maria Valley Management Area, outflow at the coast (required to prevent seawater intrusion), and subsurface flow into or out of the Northern Cities Management Area. The net subsurface flow to the NMMA is therefore likely to be positive.

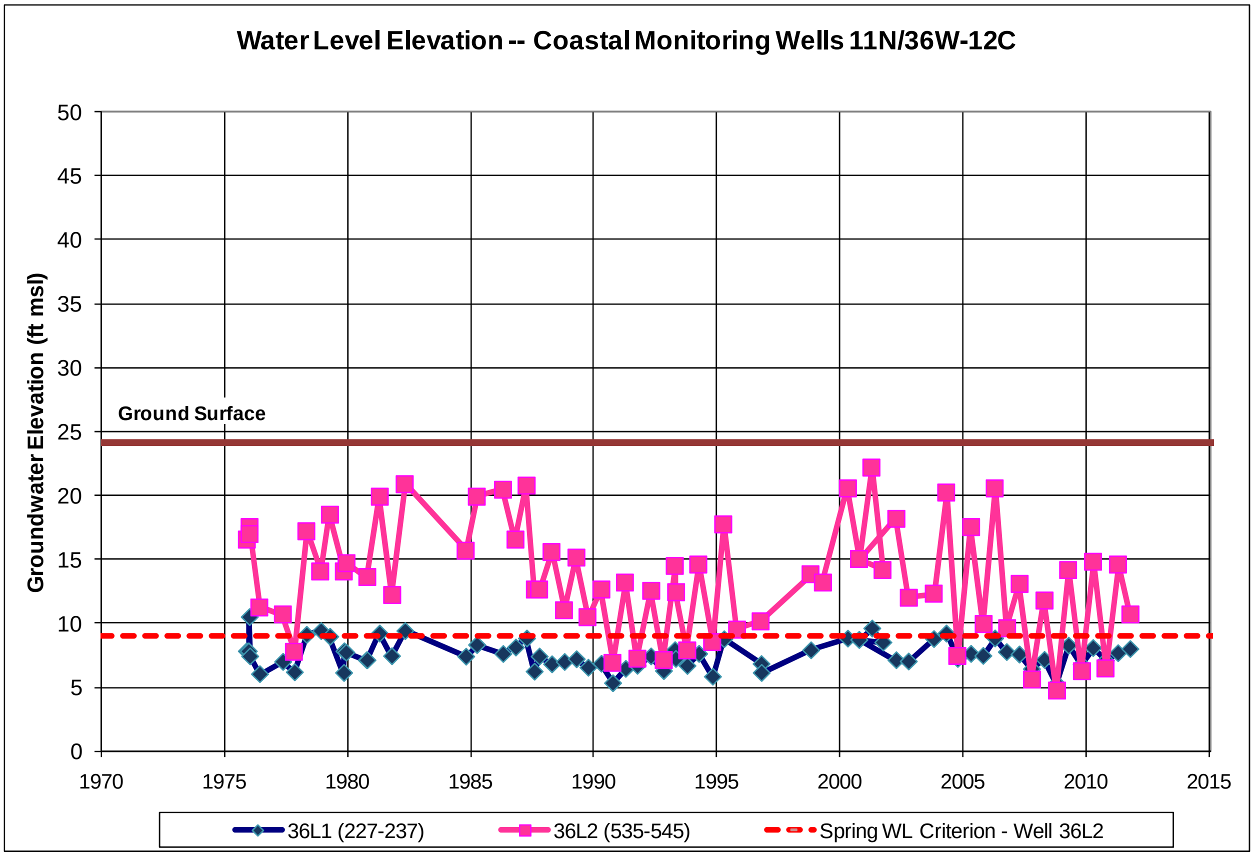

Figure 7-1. Coastal monitoring well cluster 36L. *The criterion for Potentially Severe Water Shortage Conditions for well 36L2 indicated by dashed line.*

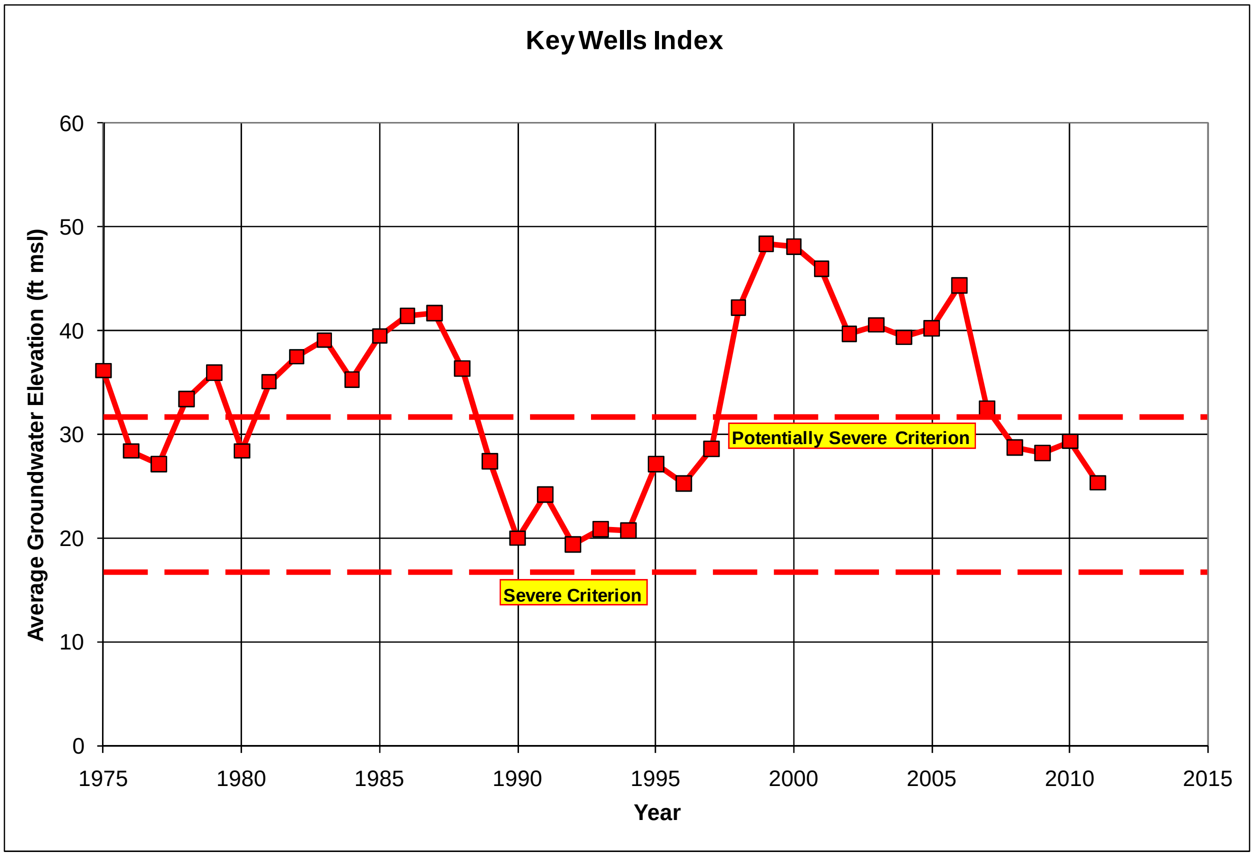

Figure 7-2. Key Wells Index. *The upper dashed line is the criterion for Potentially Severe Water Shortage Conditions and the lower dashed line is the criterion for Severe Water Shortage Conditions.*

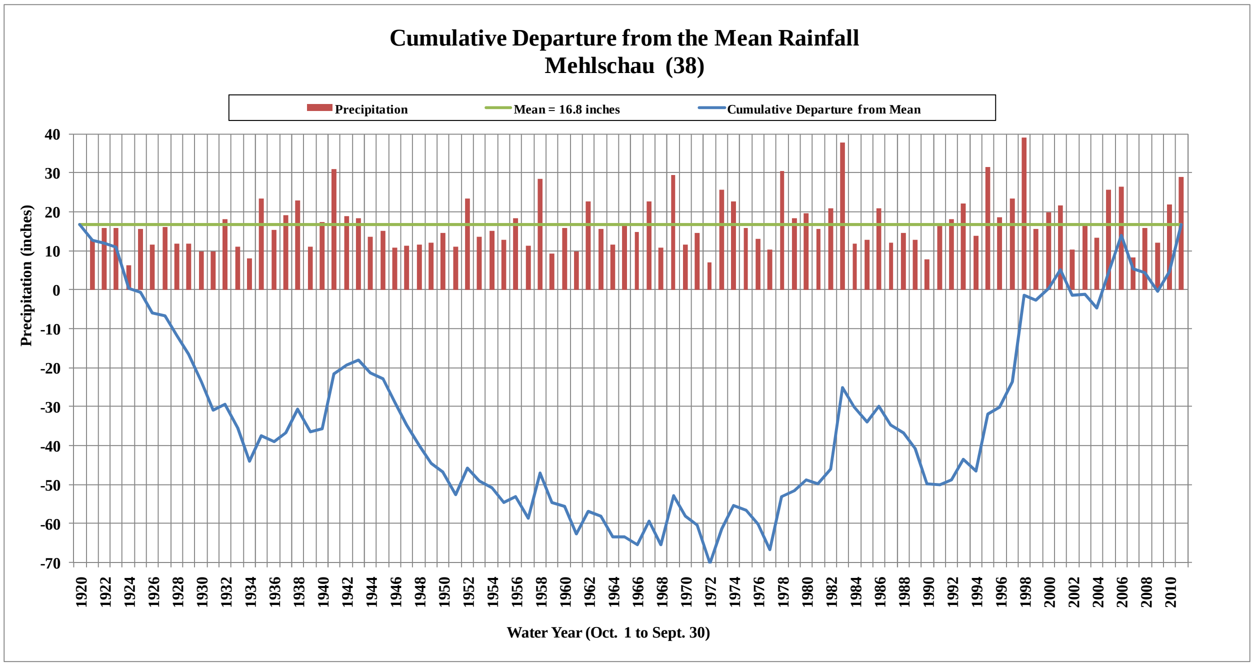

Figure 7-3. Rainfall: Cumulative Departure from the Mean – Rainfall Gauge Mehlschau (38)

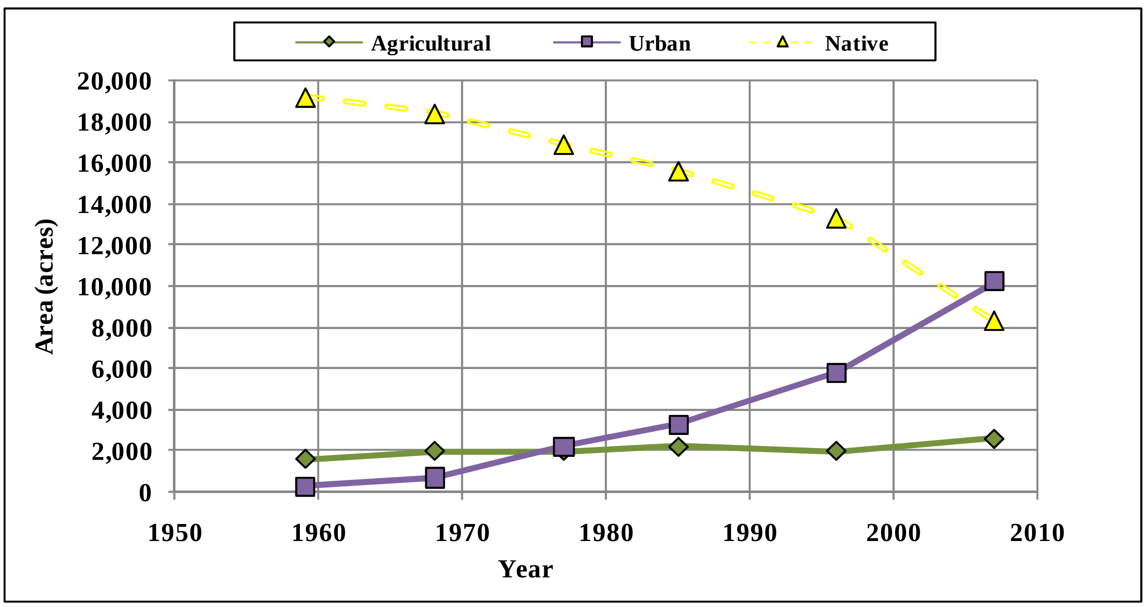

Figure 7-4. NMMA Land Use – 1959 to 2007

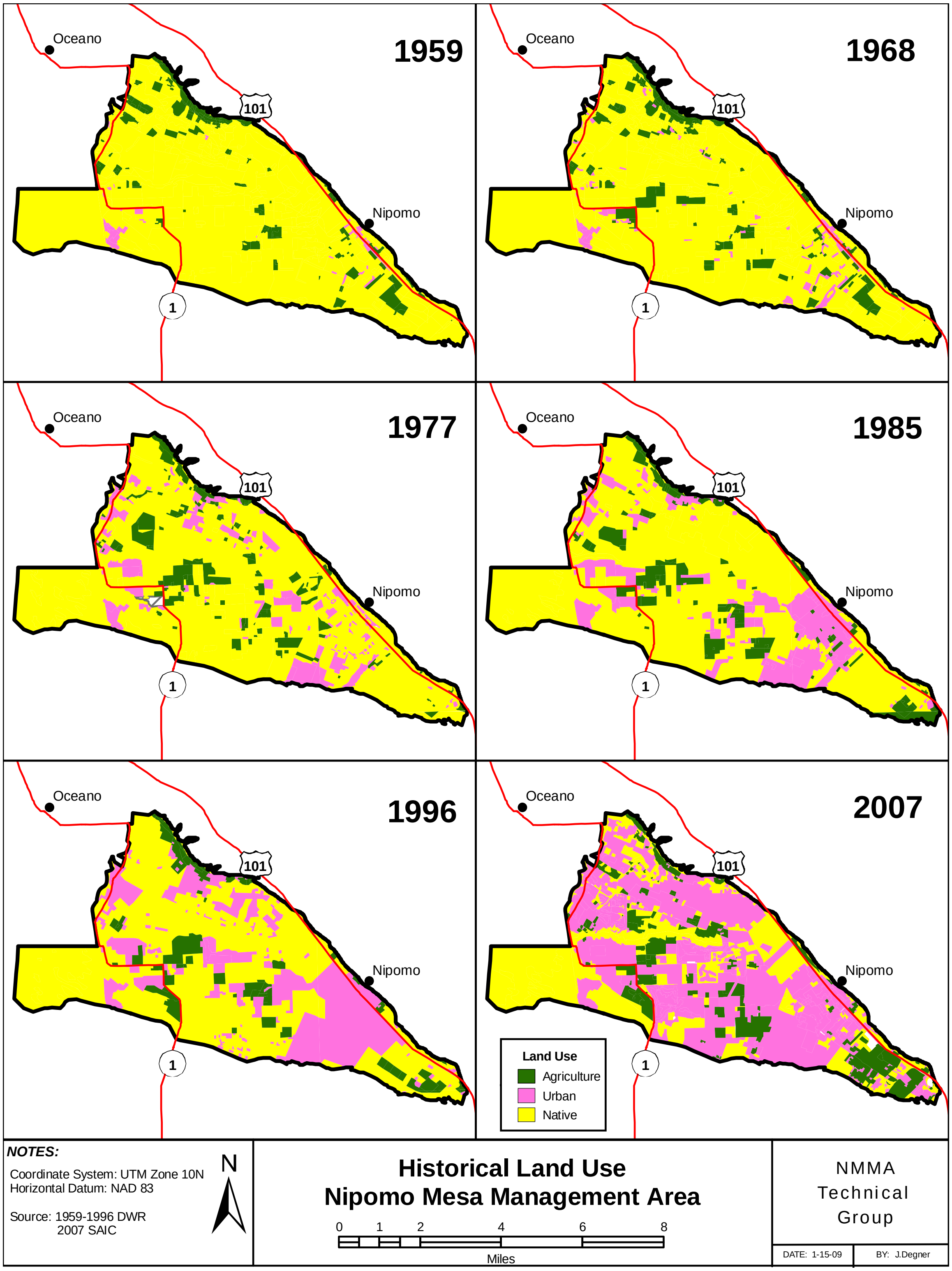

Figure 7-5. Historical Land Use in the NMMA

8. Other Considerations

8.1. *Institutional or Regulatory Challenges to Water Supply*

Several types of entities and individual landowners extract water from aquifers underlying the NMMA to meet water demands and no single entity is responsible for the delivery and management of available water supplies. Each entity must act in accordance with the powers and authorities granted under California law.

The powers and authorities for the Woodlands Mutual Water Company and Nipomo Community Services District are set forth in the California Water Code. The CPUC regulates Golden State Water Company's and Rural Water Company. This diversity of the public water purveyors' powers and the locations of their respective service areas (Figure 1-1) must be taken into account in attempting to develop consistent water management strategies that can be coupled with enforceable measures to ensure timely compliance with recommendations made by the TG, or mandatory Court orders. This is particularly true when there are legal requirements relating to the timing of instigating changes in water rates, implementation of mandatory water conservation practices or forcing a change in pumping patterns which may require one entity to deliver water to a location outside its service area.

A cooperative effort among the purveyors and other parties is the only expedient means to meet these institutional and regulatory challenges relating to the water supply and overall management of the NMMA. The purveyors developed a Well Management Plan (WMP) in calendar year 2010 which outlines steps to take in "potentially severe water shortage conditions" as well as in "severe water shortage conditions"[1]. The WMP identifies a list of recommended water use restrictions to limit prohibited, nonessential and unauthorized water uses. For each condition, the WMP also identifies both voluntary and mandatory actions such as conservation goals, shifts in pumping patterns, and potential additional use and pumping restrictions. NCSD is developing the engineering design of the NSWP, which will provide for the delivery of supplemental water within the NMMA.

9. Recommendations

A list of recommendations were developed and published in each of the previous NMMA Annual Reports. The TG will address past and newly developed recommendations along with the implementation schedule based on future budgets, feasibility, and priority. The recommendations are subdivided into three categories: (1) Draft capital and operation expenditure plan, (2) Achievements from earlier NMMA Annual Report recommendations accomplished in 2011; and (3) Technical Recommendations – to address the needs of the TG for data collection and compilation.

9.1. *Funding of Capital and Operating Expenditure Program*

The TG acknowledges that the work items and budget presented below represent a consensus view that additional technical work is necessary beyond that covered under the current annual budget

[1] See Appendix B- "NMMA Water Shortage Conditions and Response Plan" which defines these conditions.

limit. Completing this broader scope of work will require a formal adjustment to the NMMA TG budget limit.

Table 9-1. NMMA 5-Year Cost Analysis

Task Description	Total Cost	Targeted Completion Year	Projected 5-year Cash Flow				
			2012	2013	2014	2015	2016
Yearly Tasks							
Annual Report preparation			$50,000	$50,000	$50,000	$50,000	$50,000
Grant funding efforts			$10,000	$10,000	$10,000	$10,000	$10,000
Confining layer definition			$10,000	$10,000	$10,000	$10,000	$10,000
Well head surveying			$3,000	$3,000	$3,000	$3,000	$3,000
Analytical testing			$5,000	$5,000	$5,000	$5,000	$5,000
Long Term Studies							
Groundwater model (NMMA share)	$250,000	2016	$33,300	$33,300	$33,300	$75,000	$75,000
Capital Projects							
Oso Flaco monitoring well	$130,000	2014	$43,300	$43,300	$43,300	- -	- -
Automatic monitoring equipment	$25,000	2016	- -	- -	- -	$12,500	$12,500
Total Projected Annual Cost			$154,600	$154,600	$154,600	$165,500	$165,500

9.2. *Achievements from previous NMMA Annual Report Recommendations*

The TG worked diligently to address several of the recommendations outlined in the previous Annual Reports. Accomplishments and/or progress made during 2011 include:

- Development of refined cross-sections through key areas of the basin,
- Reviewed and identified existing well locations and recommended additional monitoring to be incorporated into the County water level monitoring program, and
- Met with representatives from Northern Cities Management Area and Santa Maria Valley Management Area to discuss groundwater modeling possibilities, groundwater monitoring activities, methodology to estimate percolation, and sea water intrusion findings.

9.3. *Technical Recommendations*

The following technical recommendations are not organized in their order of priority, because the monitoring parties, considering their own particular funding constraints and authorities, will determine the implementation strategies and priorities. However, the TG has suggested a priority for some of the technical recommendations.

- **Supplemental Water Supply –** An additional water supply that would allow reduced pumping within the NMMA is the most effective method of reducing the stress on the aquifers and allow groundwater elevations to recover. The NSWP (see Section 1.1.7-Supplemental Water) is the fastest method of obtaining alternative water supplies. Given the Potentially Severe Water

Shortage Conditions within the NMMA and the other risk factors discussed in this Report, the TG recommends that this project be implemented as soon as possible.

- **Subsurface Flow Estimates – C**ontinue to develop and evaluate geologic cross-sections along NMMA boundaries and make estimates of subsurface flow.

- **Severe Water Shortage Conditions –** The TG will evaluate the potential mandatory responses to the Severe Water Shortage Conditions as prescribed in the Stipulation Paragraph VI(D)(1b)(i)-(v).

- **Installation of Groundwater Monitoring Equipment –** When a groundwater level is measured in a well, both the length of time since the measured well is shut off and the effect of nearby pumping wells modify the static water level in the well being measured. For the Key Wells, the installation of transducers and data loggers will largely solve this problem. Installation of transducers is also recommended for purveyors' wells that pump much of the time.

- **Changes to Monitoring Points or Methods –** The coastal monitoring wells are of great importance in the Monitoring Program. The inability to locate the monitoring well cluster under the sand dunes proximally north of Oso Flaco Lake renders the southwestern coastal portion of the NMMA without adequate coastal monitoring. During 2009 and 2010, the NMMA TG reviewed options for replacing this lost groundwater monitoring site. The TG was given written support of the concept from the State Parks Department to allow replacement of the well, and the TG has also had discussions with San Luis Obispo County, which may be able to provide some financial assistance for the project. The NMMA TG has incorporated replacement of this monitoring well in its long-term capital project planning and will investigate possible State or Federal grants for financial assistance with the construction of this multi-completion monitoring well.

- **Well Management Plan –** It is recommended that for calendar year 2012, purveyors compile and present to the TG a Well Management Plan status update.

- **County of San Luis Obispo Monitoring Locations –** Review proposed County of San Luis Obispo monitoring well and stream gauge locations.

- **Well Reference Point Elevations –** It is recommended that all the wells used for monitoring have an accurate RP elevation established over time. This could be accomplished by surveying a few wells every year or by working with the other Management Areas and the two counties in the Santa Maria Groundwater Basin to obtain LIDAR data for the region; the accuracy of the LIDAR method allows one-foot contours to be constructed and/or spot elevations to be determined to similar accuracy.

- **Groundwater Production –** Estimates of total groundwater production are based on a combination of measurements provided freely from some of the parties, and estimates based on land use. The TG recommends developing a method to collect groundwater production data from all stipulating parties. The TG recommends updating the land use classification on an interval commensurate with growth and as is practical with the intention that the interval is more frequent than DWR's 10-year cycle of land use classification.

- **Increased Collaboration with Agricultural Producers –** To better estimate agricultural groundwater production where data is incomplete, it is recommended that the TG work with a subset of farmers to measure groundwater production. This measured groundwater production can then be used to calibrate models and verify estimates of agricultural groundwater production where data are not available.

- **Hydrogeologic Characteristics of NMMA –** Further defining the continuity of confining conditions within the NMMA remains a topic of investigation by the TG. The locations of confined and unconfined conditions is important – they control to a significant degree both the NMMA groundwater budget as to the quantity of recharge from overlying sources and any calculation of changes in groundwater storage. Further review is needed of well screen intervals, lithology, groundwater level, and other relevant information to segregate wells into the different aquifers groups (e.g. shallow versus deep aquifers) for preparation of groundwater elevation contour maps for different aquifers. In addition, the NMMA will be requesting geologic information obtained during the PG&E long-term seismic studies program.

- **Modifications of Water Shortage Conditions Criteria –** The Water Shortage Conditions and Response Plan was submitted to the Court in 2008. The TG will review the plan on a regular basis.

- **Groundwater Modeling –** The TG continues to recommend the advancement of a groundwater model as presented in the NMMA 5-year Cost Analysis. This may include collaboration with the Northern Cities Management Area, the Santa Maria Valley Management Area or both.

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Appendices